GEOTECHNICAL INVESTIGATION MINNETEX AREA AND ALMEDA GENOA PLACE DRAINAGE AND PAVING IMPROVEMENTS WBS NO. M-000289-0002-3 HOUSTON, TEXAS

REPORT NO. 1140195801

Reported to:

KIT PROFESSIONALS, INC.

Houston, Texas

Submitted by:

GEOTEST ENGINEERING, INC.

Houston, Texas

April 30, 2014

Key Map Nos. 574 N



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Report No. 1140195801April 30, 2014

Mr. Sree Punukula, P.E. KIT Professionals, Inc. 2000 West Sam Houston Parkway S., Suite 1400 Houston, Texas 77042

Reference:

Geotechnical Investigation

Minnetex Area and Almeda Genoa Place Drainage and Paving Improvements

WBS No. M-000289-0002-3

Houston, Texas

Dear Mr. Punukula:

Presented herein is our final geotechnical investigation report for the Minnetex Area and Almeda Genoa Place Drainage and Paving Improvements Project. A draft report was submitted to you on October 14, 2013. This final report supersedes all previously submitted reports, transmittals, etc. for the referenced project. This study was authorized by Notice to Proceed email dated July 11, 2013 by accepting our proposal No. 1140333299 dated May 16, 2013.

We appreciate this opportunity to be of service to you. If you have any questions regarding the report, or if we can be of further service to you, please call us.

Sincerely,

GEOTEST ENGINEERING, INC.

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EXECUTIVE SUMMARY

A geotechnical investigation was performed for the design and construction of the proposed Minnetex Area and Almeda Genoa Place Drainage and Paving Improvements project in Houston, Texas. The project is comprised of approximately 11,730 LF of pavement reconstruction (with rigid pavement) and the utilities replacement along several streets in the Minnetex Area and Almeda Genoa Place. The utilities include storm sewer, water line and sanitary sewer with proposed sizes ranging from 6 inches to 48 inches and utilities depths ranges from 4 to 23 feet. The proposed construction is by open cut method.

The purposes of this study were to evaluate soil and groundwater conditions and to provide geotechnical recommendations for the proposed drainage and Paving Improvements for Minnetex Area and Almeda Genoa Place. The investigation included drilling and sampling twenty one (21) borings each to depths ranging from 20 to 32 feet, installing piezometers in four (4) existing borings, performing laboratory tests on soil samples recovered from the borings, performing engineering analyses and developing geotechnical recommendations and preparing a geotechnical report.

The principal findings and conclusions developed from this investigation are as follows:

The subsurface soil beneath pavement as encountered in borings GB-1 through GB-21 along various streets in the Minnetex Area and Almeda Genoa Place area consists of predominantly cohesive soils to the explored depths of 20 to 32 feet except in borings GB-1, GB-2, GB-6 and GB-21. In borings GB-1, GB-2, GB-6 and GB-21 the subsurface soil beneath pavement consists of cohesive with intermittent cohesionless soils or cohesive soils underlain by cohesionless soils to the explored boring depths of 20 to 32 feet. The cohesive soils consist of medium stiff to hard dark gray, gray, brown, yellowish brown and reddish brown sandy lean clay, lean clay with sand, lean clay, fat clay with sand and fat clay. The cohesionless soil consists of loose to medium dense brown and gray silty sand and sandy silt. Fill material consists of medium stiff to stiff dark gray and reddish brown fat clay with sand, shell fragments and wood was encountered between the depths of 0 to 20 feet in boring GB-15.

- Based on the available information from U.S. Geological Survey (USGS) Maps and information contained in house relating to geologic faults for the project area, the project area lies in the Mykawa Salt Dome. The Mykawa Salt Dome is associated with several surface and subsurface faults. Based on the review of the maps the nearest unnamed fault is about 500 feet northeast from the east end (Hendricksen Road) of the project area. However, based on the fact that several unknown faults were associated with the Mykawa Salt dome near the project area, to identify any fault crossings, a Phase I Geological fault study is recommended for the project.
- Groundwater was encountered in borings GB-1, GB-2, GB-4, GB-9, GB-10, GB-11, GB-12, GB-13, GB-15, GB-16, GB-17, GB-20 and GB-21 to depths ranging from 15.0 to 28.0 feet during drilling. The groundwater level, measured 15 to 20 minutes after water was first encountered, ranged from 10.4 to 21.6 feet in these borings. No groundwater was encountered in all the other borings drilled for this study. In piezometer borings GB-1P, GB-10P, GB-12P and GB-17P, the water level measured at 30 days ranges from 10.8 to 17.3 feet.
- The existing paving as obtained in the soil borings GB-1 through GB-21 consists of 3.0 to 16.0 inches of asphalt over 0 to 12.0 inches of shell, sand and shell base except in boring GB-18. Boring GB-18 was drilled in the grass area.
- All excavation operations for utilities should be carried out in accordance with OSHA standards and the City of Houston Standard Specifications. The backfill for utilities should be designed and constructed in accordance with City of Houston Standard Specification No. 02317.

The recommended pavement section for the various streets in the project area is given below:

Streets	Pavement Section
Lincolnshire Road, Glengarry Road	, 7" Reinforced Concrete over 6" Lime
Allison Road, Hendricksen Road	, Stabilized Subgrade
Cottingham Road and Lea Road	

The details of pavement section are provided in Section 5.4 of this report.

1.0 INTRODUCTION

1.1 General

The City of Houston selected KIT Professionals to perform engineering services for the design and construction of Minnetex Area and Almeda Genoa Place Drainage and Paving Improvements Project in Houston, Texas. KIT Professionals, Inc. retained Geotest Engineering, Inc. as a part of the design team to perform geotechnical investigation for the above project.

1.2 Authorization

This study was authorized by Notice to Proceed email dated July 11, 2013 by accepting our proposal No. 1140333299 dated May 16, 2013.

1.3 Location and Description of Project

The project is located in Minnetex Area and Almeda Genoa Place in Houston, Texas. The project area is bounded by Almeda Genoa Road to the north, Hendricksen Road to the east, Allison Road to the south and Pembroke Drive to the west, within the Key Map Page and Grid 574 N.

The project is comprised of approximately 11,730 LF of pavement reconstruction (with rigid pavement) and the utilities replacement along several streets in the Minnetex Area and Almeda Genoa Place. The utilities include storm sewer, water line and sanitary sewer with proposed sizes ranging from 6 inches to 12 inches of water line, 8 inches to 36 inches of sanitary sewer and 24 inches to 48 inches of storm sewer. The depth of the storm sewer ranges from approximately 6 feet to 23 feet and the depth of the sanitary sewer ranges from approximately 8 feet to 18 feet. The water line depth is about 4 to 5 feet. The proposed construction is by open cut method. The vicinity map of the project area is shown on Figure 1.

1.4 Purpose and Scope

The purposes of this study were to evaluate soil and groundwater conditions and to provide geotechnical recommendations for the design and construction of the proposed drainage and paving improvements in the Minnetex Area and Almeda Genoa Place. The scope of this investigation for consisted of the following:

- Drilling and sampling twenty one (21) borings to depths ranging from 20 to 32 feet.
- Converting four (4) borings into piezometers to monitor long term ground water level.
- Performing appropriate laboratory tests in accordance with ASTM methods on selected samples to develop engineering properties of the soil.
- Reviewing available fault information to evaluate the potential for known active faults that may impact the project.
- Performing engineering analyses in accordance with the City of Houston Design Manual (July 2012) to develop geotechnical recommendations for the design and construction of the proposed drainage and paving improvements in Minnetex Area and Almeda Genoa Place project area.
- Preparing a geotechnical report that will include all field data, laboratory test data and geotechnical recommendations.
- Preparing a separate soil type report for trench (open cut) excavation.

2.0 FIELD INVESTIGATION

2.1 General

After obtaining the utilities clearance of proposed twenty one (21) marked borings in the field, the borings were drilled to the explored depths utilizing a truck mounted drilling rig. Traffic control devices and personnel were utilized during coring and drilling to maintain safety of drill crew and people driving in the streets. All the drilling and sampling were performed in accordance with appropriate ASTM procedures.

2.2 Geotechnical Borings

Subsurface conditions for the project area were explored by drilling and sampling twenty one (21) soil borings (designated as GB-1 through GB-21) each to depths ranging from 20 to 32 feet. The approximate boring locations are shown on Figures 2.1 and 2.2, Plan of Borings. Survey information (Northing and Easting coordinates and ground surface elevation) of completed borings was provided to us by KIT Professionals, Inc. The survey information of completed borings is summarized in Table 1.

In general, samples were obtained continuously to the depth of 20 feet, and intermittent sampling at 5 foot intervals to the termination depths 20 to 32 feet for all borings. Cohesive soils were obtained with a 3-inch thin-walled tube sampler in general accordance with ASTM Method D 1587 and samples of granular soils were obtained with a 2-inch diameter split-barrel sampler in general accordance with ASTM Method D 1586. Each sample was removed from the sampler in the field, carefully examined and then logged by an experienced soils technician. Suitable portions of each sample were sealed and packaged for transportation to Geotest's Laboratory. The shear strength of cohesive soil samples was estimated using a pocket penetrometer in the field. Driving resistances for the split-barrel sampler were recorded as "Blows per Foot" on the boring logs. All the borings, except the ones converted to piezometers, were grouted with cement-bentonite grout after completion of drilling and obtaining water level measurements.

Detailed descriptions of the soils encountered in the borings are given on the boring logs presented on Figures A-1 through A-21 in Appendix A. A key to symbols and terms used on boring logs is given on Figure A-22 in Appendix A.

2.3 Piezometer Installation

During the field investigation, piezometers were installed in the open borehole of borings GB-1, GB-10, GB-12 and GB-17. The location of the piezometers, designated as GB-1P, GB-10P, GB-12P and GB-17P, are shown on Figures 2.1 and 2.2 (Plan of Borings). The piezometer installation report showing the details of the construction of the piezometers are provided on Figures A-23 through A-26 in Appendix A.

The piezometers were abandoned in place after taking the final water level measurements. The piezometer abandonment reports were presented in Appendix C.

3.0 LABORATORY TESTING

The laboratory testing program was designed to evaluate the pertinent physical properties and shear strength characteristics of the subsurface soils. Classification tests were performed on selected samples to aid in soil classification. All the tests were performed in accordance with ASTM Standards.

Undrained shear strengths of selected cohesive samples were measured by unconsolidated undrained (UU) triaxial compression tests (ASTM D 2850). The results of the UU triaxial compression tests are plotted on the boring logs as solid squares. The shear strength of cohesive samples was measured in the field with a calibrated hand pocket penetrometer and also in the laboratory with a Torvane. The shear strength values obtained from the penetrometer and Torvane are plotted on the boring logs as open circles and triangles, respectively.

Measurements of moisture content and dry unit weight were taken for each UU triaxial compression test sample. Moisture content (ASTM D 2216) measurements were also made on other samples to define the moisture profile at each boring location. The liquid and plastic limit tests (ASTM D 4318) and percent passing No. 200 sieves (ASTM D 1140) were performed on appropriate samples. Sieve analysis (ASTM D 422) was also performed on selected cohesionless soil sample.

The result of all tests are tabulated or summarized on the boring logs presented on Figures A-1 through A-21 in Appendix A. The summary of laboratory tests is also presented in a tabular form on Figures B-1 through B-21 in Appendix B. The grain size distribution curves are presented on Figure B-22 in Appendix B.

4.0 SUBSURFACE CONDITIONS

4.1 Geology

The project area lies in the Beaumont Formation. The clays and sands of the Beaumont Formation are over-consolidated as a result of desiccation from frequent rising and lowering of the sea level and the groundwater table. Consequently, clays of this formation have moderate to high shear strength and relatively low compressibility. The sands of the Beaumont Formation are typically very fine and often silty. Further, there is occasional evidence in the Houston area of the occurrence of cemented material (sandstone and siltstone) deposits within the Beaumont Formation.

4.2 General Fault Information

A review of information in the Geotest library, relating to known surface and subsurface geologic faults in the general area of the project alignments, was undertaken. The available information consisted of U.S. Geological and NASA maps, open file reports and information contained in our files relating to geologic faults in the project area.

Based on the available information from U.S. Geological Survey (USGS) Maps and information contained in house relating to geologic faults for the project area, the project area lies in the Mykawa Salt Dome. The Mykawa Salt Dome is associated with several surface and subsurface faults. Based on the review of the maps the nearest unnamed fault is about 500 feet northeast from the east end (Hendricksen Road) of the project area. However, based on the fact that several unknown faults were associated with the Mykawa Salt dome near the project area, to identify any fault crossings, a Phase I Geological fault study is recommended for the project. The Phase I Geological Fault Study will be performed as a separate study and will be submitted under separate cover.

4.3 Existing Paving

The existing paving as obtained in the soil borings GB-1 through GB-21 consists of 3.0 to 16.0 inches of asphalt over 0 to 12.0 inches of shell, sand and shell base except in boring GB-18. Boring GB-18 was drilled in the grass area.

The details of the existing pavement thickness at each of the boring locations for Minnetex Area and Almeda Genoa Place Project area are summarized below:

Boring Nos.	Asphalt Thickness	Base Thickness	Total (in.)
	(in)	(in)	
GB-1 (GB-1P)	3.5	8.0	11.5
GB-2	8.0	4.0	12.0
GB-3	8.0	4.0	12.0
GB-4	8.0	4.0	12.0
GB-5A	6.0	8.0	14.0
GB-6	6.0	6.0	12.0
GB-7	8.0	4.0	12.0
GB-8	6.0	6.0	12.0
GB-9	6.0	6.0	12.0
GB-10 (GB-10P)	6.0	10.0	16.0
GB-11	4.0	7.0	11.0
GB-12 (GB-12P)	9.0	3.0	12.0
GB-13	3.0	6.0	9.0
GB-14	6.0	10.0	16.0
GB-15	6.0	12.0	18.0
GB-16	6.0	12.0	18.0
GB-17 (GB-17P)	6.0	12.0	18.0
GB-19	16.0		16.0
GB-20	16.0		16.0
GB-21	4.0	5.0	9.0

Note: The base includes shell, sand and shell. Boring GB-18 was drilled in grass area.

4.4 Soils Stratigraphy

Based on the subsurface soils encountered in the boreholes, six (6) boring log profiles were developed and are presented on Figures 3.1 through 3.6. To the left of each boring shown on the profile is an indication of the consistency of each stratum. More than one consistency for an individual stratum indicates that the consistency is different at different depths within the stratum. For cohesive soils, consistency is related to the undrained shear strength of the soil. For cohesionless soils, the relative density of soil is measured by standard penetration test blows of the soil. To the right of each boring shown on the profile is the overall classification of the soil contained within each stratum. The symbols and abbreviations used on the boring log profile are given on Figure 4. The soil classification is based on ASTM Standards.

The subsurface soils beneath pavement as encountered in borings GB-1 through GB-21 and as shown in boring log profiles 3.1 through 3.6 along various streets in the Minnetex Area and Almeda Genoa Place area are summarized below:

Lincolnshire Road:

Boring No.	Location/Street	Boring Depth (ft)	Soil Description
GB-1 thru GB-5A	Lincolnshire Road	0-25	Medium stiff to hard gray, brown, yellowish
and			brown and reddish brown Fat Clay, Fat Clay
GB-16			with sand and Lean Clay w/sand.
(Boring Log Profile Figures 3.1)			A stratum of loose brown Sandy Silt was encountered in boring GB-1 between depths of 16 and 23 feet and loose brown Silty Sand was encountered in borings. GB-2 between the depths of 14 and 17 feet.

The Fat Clay and Fat Clay with sand are of high to very high plasticity with a liquid limits ranging from 56 to 84 and a plasticity indices ranging from 34 to 54. The Lean Clay w/sand is of medium plasticity with a liquid limit of about 35 and a plasticity index of about 18. The percent fines (percent passing No. 200 sieve) of Fat Clay with sand and Fat Clay ranges from 83 to 100 percent. The percent fines of Sandy Silt is about 56 percent. The percent fines of Silty Sand is about 44 percent.

Glengarry Road:

Boring No.	Location/Street	Boring Depth (ft)	Soil Description
GB-6 through	Glengarry Road	0-25	Medium Stiff to hard gray, yellowish brown
GB-10 and GB-15			and reddish brown and gray Fat Clay with
			sand, Fat Clay and Sandy Lean Clay, Lean
(Boring Log Profile			Clay with sand and Lean Clay. A layer of
Figure 3.2)			medium dense reddish brown Silty Sand was
			encountered in boring GB-6 between depths of
			23.5 and 25 feet. Fill material consisting of
			medium stiff to stiff gray, dark gray lean clay
			w/sand, fat clay with shell, gravel and wood
			was encountered between depths of 0 and 20
			feet in boring GB-15.

The Fat Clay and Fat Clay with sand is of high to very high plasticity with liquid limits ranging from 53 to 77 and plasticity indices ranging from 31 to 49. The Lean Clay and Lean Clay with sand are of medium plasticity with liquid limits ranging from 36 to 47 and a plasticity indices ranging from 19 to

30. The percent fines (percent passing No. 200 sieve) of Fat Clay and Fat Clay with sand ranges from 82 to 98 percent. The percent fines of Lean Clay is about 93 percent. The percent fines of Silty Sand is about 32 percent.

Allison Road:

Boring No.	Location/Street	Boring Depth (ft)	Soil Description
GB-11 through	Allison Road	0-30	Medium stiff to hard dark gray, gray, brown,
GB-14 and GB-19			yellowish brown and reddish brown Fat Clay
			with sand, Fat Clay, Lean Clay with sand and
(Boring Log Profile			Lean Clay.
Figure 3.3)			

The Fat Clay with sand and Fat Clay is high to very high plasticity with liquid limit ranging from 51 to 82 and plasticity indices ranging from 30 to 53. The Sandy Lean Clay, Lean Clay with sand and Lean Clay is of medium plasticity with a liquid limit ranging from 39 to 40 and plasticity indices ranging from 23 to 24. The percent fines (percent passing No. 200 sieve) of Fat Clay with sand ranges from 75 to 78 percent. The percent fines of Lean Clay and Fat Clay ranges from 87 to 100 percent. The percent fines of Sandy Lean Clay is about 68 percent.

Cottingham Road:

Boring No.	Location/Street	Boring Depth (ft)	Soil Description
GB-14 through	Cottingham Road	0-31	Medium stiff to hard gray, brown, yellowish
GB-17			brown and reddish brown Fat Clay, Fat Clay with sand, Lean Clay and Lean Clay with
(Boring Log Profile			sand. Fill material consisting of medium stiff
Figure 3.4)			to stiff dark gray, gray, and reddish brown
			Lean Clay w/sand and Fat Clay with sand,
			shell and wood was encountered between the
			depths of 0 to 20 feet in boring GB-15.

The Fat Clay and Fat Clay with sand is of high to very high plasticity with liquid limits ranging from 51 to 77 and plasticity indices ranging from 30 to 49. The Lean Clay and Lean Clay with sand is of medium to high plasticity with liquid limits ranging from 36 to 45 and plasticity indices ranging from 17 to 23. The percent fines of Fat Clay and Lean Clay ranges from 86 to 100. The percent fines of Fat Clay with sand and Lean Clay w/sand ranges from 75 to 82 percent.

Martin Luther King Drive:

Boring No.	Location/Street	Boring Depth (ft)	Soil Description
GB-18	Martin Luther	0-32	Medium Stiff to hard dark gray, gray, brown
	King		and reddish brown Fat Clay, Fat Clay with
			sand and Sandy Lean Clay.

The Fat Clay and Fat Clay with sand is of high to very high plasticity with liquid limits ranging from 61 to 84 and plasticity indices ranging from 37 to 54. The percent fines (percent passing No. 200 sieve) of Fat Clay and Fat Clay w/sand ranges from 78 to 99 percent.

Hendricksen Road:

Boring No.	Location/Street	Boring Depth (ft)	Soil Description
GB-5A, GB-10,	Hendricksen Road	0-25	Stiff to hard gray, brown, yellowish brown and
GB-19 and GB-20			reddish brown Fat Clay and Fat Clay w/sand.
(Boring Log			
Profile, Figures			
3.5)			

The Fat Clay and Fat Clay w/sand is of high to very high plasticity with liquid limit ranging from 64 to 80 and plasticity indices ranging from 39 to 51. The percent fines (percent passing No. 200 sieve) of Fat Clay ranges from 92 to 100 percent. The percent fines of Fat Clay w/sand is about 83 percent.

Lea Road:

Boring No.	Location/Street	Boring Depth (ft)	Soil Description
GB-2, GB-7,	Lea Road	0-25	Medium stiff to very stiff gray and reddish
GB-11 and GB-21			brown Fat Clay, Fat Clay with sand, Lean
			Clay, Lean Clay with sand and Sandy Lean
(Boring Log Profile			Clay. Loose to medium dense reddish brown
Figure 3.6)			Silty Sand was encountered in borings GB-2
			and GB-21 between the depths of 14 to 17 and
			16 to 18 feet, respectively.

The Fat Clay and Fat Clay with sand is of high to very high plasticity with liquid limits ranging from 52 to 66 and plasticity indices ranging from 31 to 43. The Lean clay, Lean Clay with sand and Sandy Lean Clay is of medium to high plasticity with liquid limits ranging from 39 to 47 and plasticity indices ranging from 23 to 30. The percent fines (percent passing No. 200 sieve) of Fat Clay and Lean

Clay ranges from 94 to 100 percent and the percent fines of Fat Clay with sand and Lean Clay with sand ranges from 78 to 85 percent. The percent fines of Sandy Lean Clay is about 59 percent. The percent fines of Silty Sand ranges from 43 to 44 percent.

4.5 Water Levels

Groundwater was encountered in borings GB-1, GB-2, GB-4, GB-9, GB-10, GB-11, GB-12, GB-13, GB-15, GB-16, GB-17, GB-20 and GB-21 to depths ranging from 15.0 to 28.0 feet during drilling. The groundwater level, measured 15 to 20 minutes after water was first encountered, ranged from 10.4 to 21.6 feet in these borings. No groundwater was encountered in all the other borings drilled for this study. In piezometer borings GB-1P, GB-10P, GB-12P and GB-17P, the water level measured at 30 days ranges from 10.8 to 17.3 feet.

	Location/Street	Groundwater Depth During	Groundwater Depth 30 Days
Boring No.	Name	Drilling (ft)	After Drilling (ft)
GB-1 (GB-1P)	Lincolnshire	12.0	11.3 (8-28-13)
GB-2	Lincolnshire	10.9	N/A
GB-4	Lincolnshire	20.6	N/A
GB-9	Glengarry	17.0	N/A
GB-10 (GB-10P)	Glengarry	Dry	10.8 (8-28-13)
GB-11	Allison	10.4	N/A
GB-12 (GB-12P)	Allison	Dry	17.3 (8-28-13)
GB-13	Allison	13.3	N/A
GB-15	Cottingham	17.2	N/A
GB-16	Cottingham	18.3	N/A
GB-17 (GB-17P)	Cottingham	16.8	15.8 (8-28-13)
GB-20	Hendricksen	21.0	N/A
GB-21	Lea	11.4	N/A

However, it should be noted that various environmental and man-made factors such as amount of precipitation, nearby subsurface construction activities, and change in area drainage can substantially influence the groundwater level.

4.6 Environmental Concerns

No environmental concerns were observed or noticed in any of the borings (GB-1 through GB-21) drilled for this study.

5.0 ENGINEERING ANALYSES AND RECOMMENDATIONS

5.1 General

The project is comprised of approximately 11,730 LF of pavement reconstruction (with rigid pavement) and the utilities replacement along several streets in the Minnetex Area and Almeda Genoa Place. The utilities include storm sewer, water line and sanitary sewer with proposed sizes ranging from 6 inches to 12 inches of water line, 8 inches to 36 inches of sanitary sewer and 24 inches to 48 inches of storm sewer. The depth of the storm sewer ranges from approximately 6 feet to 23 feet and the depth of the sanitary sewer ranges from approximately 8 feet to 18 feet. The water line depth is about 4 to 5 feet. The proposed construction is by open cut method.

5.2 Trench Excavation

Based on the information provided by KIT Professionals, Inc., it is understood that the water line, storm sewer and sanitary sewer will be installed by open cut method of construction. The following subsections provide information for the design and construction of the storm sewer and sanitary sewer open cut method of excavations.

5.2.1 Geotechnical Parameters. Based on the soil conditions revealed by the borings GB-1 through GB-21, geotechnical parameters were developed for the design of open cut construction for storm sewer and sanitary sewer installation. The design parameters are provided in Table 2. For design, the groundwater level should be assumed to exist at the ground surface.

5.2.2 Excavation Stability. The open excavation may be shored or laid back to a stable slope or supported by some other equivalent means used to provide safety for workers and adjacent structures, if any. The excavating operations should be in accordance with OSHA Standards, OSHA 2207, Subpart P, latest revision and the City of Houston Standard Specification.

Excavation Shallower Than 5 Feet - Excavations that are less than 5 feet deep (critical height) should be effectively protected when an indication of dangerous ground movement is anticipated.

Geotest Engineering, Inc.
Minnetex Area and Almeda Genoa Place Drainage and Paving
Improvements Project; WBS No. M-000289-0002-3; Houston, Texas

- Excavations Deeper Than 5 Feet Excavations that are deeper than 5 feet should be sloped, shored, sheeted, braced or laid back to a stable slope or supported by some other equivalent means or protection such that workers are not exposed to moving ground or cave-ins. The slopes and shoring should be in accordance with the trench safety requirements as per OSHA Standards. The following items provide design criteria for excavation stability.
 - (i) OSHA Soil Type. Based on the soil conditions revealed by borings drilled for this study and assumed groundwater level at surface, OSHA soil type "C" should be used for determination of allowable maximum slope and/or the design of shoring along the alignment for full proposed depth of open excavation. For shoring deeper than 20 feet (if needed), an engineering evaluation is required and deeper soil borings will be needed.
 - (ii) Excavation Support Earth Pressure. Based on the subsurface conditions indicated by our field investigation and laboratory testing results, excavation support earth pressure diagram is developed and is presented on Figure 5. This pressure diagram can be used for the design of temporary trench bracing. For a trench box, a lateral earth pressure resulting from an equivalent fluid with a unit weight of 92 pcf can be used. The effects of any surcharge loads at the ground surface should be added to the computed lateral earth pressures. A surcharge load, q, will typically result in a lateral load equal to 0.5 q. The above value of equivalent fluid pressure is based on assumption that the groundwater level is near the ground surface, since these conditions may exist after a heavy rain or flooding.
 - (iii) <u>Bottom Stability.</u> In braced cuts, if tight sheeting is terminated at the base of the cut, the bottom of the excavation can become unstable. The parameters that govern the stability of the excavation base are the soil shear strength and the differential hydrostatic head between the groundwater level within the retained soils and the groundwater level at the interior of the trench excavation. For cut in cohesive soils as

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predominantly encountered for the proposed excavation depths (8 to 23 feet) in all

the borings, the bottom stability can be evaluated as outlined on Figure 6.

5.2.3 Groundwater Control. Excavations for the water line, sanitary sewer and storm sewer

may encounter groundwater seepage to varying degrees depending upon the groundwater conditions

at the time of construction and the location and depth of the trench. Based on the soil conditions

identified in the borings for the proposed water line, sanitary sewer and storm sewer installation, all

the excavations (for excavation depths of 8 to 23 feet) will be in cohesive soils. In general for

cohesive soils as encountered in all the borings for the excavation depths, the groundwater (if

encountered) may be managed by collection in excavation bottom sumps for pumped disposal. It is

recommended that the actual groundwater conditions should be verified by the contractor at the time

of construction and that groundwater control should be performed in general accordance with the

City of Houston Standard Specifications, Section 01578.

5.2.4 Bedding and Backfill for Storm Sewer and Sanitary Sewer. In general, excavation and

backfill for utilities should be designed and constructed in accordance with the City of Houston

Standard Specification No. 02317, Subsection 3.09 and 3.10 "Excavation and Backfill for Utilities."

Bedding and backfill for storm sewer and sanitary sewer should be in accordance with City of

Houston Standard Specification Section 02312 and Drawing No. 02317-03.

5.3 Structures

<u>5.3.1 Description.</u> The structure associated with this project will be new manholes. The new

manholes for storm sewer will be placed at depths ranging from 8 to 23 feet, while the new manholes

for sanitary sewer will be placed at depths ranging from 8 to 18 feet.

5.3.2 Foundation Conditions. Based on the soil conditions revealed by the borings GB-1

through GB-21, the manholes bottom will be in medium stiff to very stiff, fat clay, fat clay with sand,

lean clay, lean clay with sand and sandy lean clay.

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<u>5.3.3 Foundation Design Recommendations.</u> The following items provide recommendations and design criteria for construction of the new manholes.

- Allowable Bearing Pressures. The mat foundation for supporting the new manholes placed at a depths ranging from 8 to 23 feet [into medium stiff to very stiff fat clay, fat clay with sand, lean clay and sandy lean clay] should be designed for an allowable (net) bearing pressure of 2,500 psf (for manholes placed between 8 and 23 feet) for total loads. These allowable bearing pressures include a safety factor of 2.0. The above recommendations assume that the final bearing surfaces consist of undisturbed natural soils and that underlying semi-transmissive zones are properly pressure-relieved and stable undisturbed bearing surfaces are attained.
- Bottom Stability. In braced cut, if sheeting is terminated at the base of the cut, the bottom of the excavation can become unstable under a certain condition. This condition is governed by the shear strength of the soils and by the differential hydrostatic head. For cuts in cohesive soils (sandy lean clay, lean clay w/sand and fat clay, fat clay with sand), as predominantly encountered in the excavation depths of 8 and 23 feet for all of the borings, the stability of the bottom can be evaluated in accordance with the procedure outlined in Figure 6.
- <u>Lateral Earth Pressure</u>. The pressure diagram presented on Figure 5 can be used for the design of braced excavation. The lateral earth pressure diagram presented on Figure 7 is applicable for the design of the permanent walls.
- <u>Hydrostatic Uplift Resistance.</u> Structures extending below the groundwater level should be designed to resist uplift pressure resulting from excess piezometric head. Design uplift pressures should be computed based on the assumption that the water table is at ground surface. To resist the hydrostatic uplift at the bottom of the structure, one of the following sources of resistance can be utilized in each of the designs.
 - a. Dead weight of structure,
 - b. Weight of soil above base extensions plus weight of structure, or

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c. Soil-wall friction plus dead weight of structure.

The uplift force and resistance to uplift should be computed as detailed on Figure 8. In determining the configuration and dimensions of the structure using one of the approaches presented on Figure 8, the following factors of safety are recommended.

- a. Dead weight of concrete structure, $S_{f1} = 1.10$,
- b. Weight of soil (backfill) above base extension, $S_{12} = 1.5$, and
- c. Soil-wall friction, $S_{f3} = 3.0$.

Friction resistance should be discounted for the upper 5 feet, since this zone is affected by seasonal moisture changes.

5.3.4 Protection of Below Grade Structures. The design of the proper means for protection of below grade structures will depend upon the potential of the aggressivity or corrosivity of soil and groundwater properties. The aggressivity testing was not within the scope of this study. The design of the protection of below grade structures is beyond the scope of services for this study.

5.3.5 Groundwater Control During Construction. Excavations may encounter groundwater seepage to varying degrees depending upon groundwater conditions at the time of construction and the location and depth of excavation. In cohesive soils, as predominantly encountered in all of the borings for the proposed excavation depths, the groundwater may be managed by collection in trench bottom sumps for pumped disposal.

The contractor should verify the groundwater level at the time of construction and should provide an adequate dewatering system, where required.

<u>5.3.6 Structure Backfill</u>. Excavations for the proposed structures should be backfilled in accordance with the City of Houston Standard Specifications, Section 02316, "Excavation and Backfill for Structures."

5.4 Pavement Structure Design

It is understood that approximately 11,730 linear feet of existing pavement at Minnetex Area and Almeda Genoa Place project area which includes minor streets (Lincolnshire, Glengarry, Allison, Cottingham, Hendricksen and Lea) will be reconstructed with a rigid pavement. The pavement design presented below was developed in accordance with "AASHTO Guide for Design of Pavement Structures," 1993 Edition.

5.4.1 Design Parameters

Subgrade Soil Properties. Based on the laboratory test data obtained from the natural subgrade soils, the effective roadbed soil resilient modulus (M_R) is estimated to be about 1,941 psi. Based on an estimated resilient modulus of the 6-inch limestabilized subgrade, the effective modulus of subgrade reaction (k) is estimated to be about 46 pci.

<u>Traffic Data</u>. No traffic data is provided to us for the project alignments. Based on Houston Regional Traffic Counts Map, the traffic data is assumed for the streets in the project area. The details were given below.

A traffic data of $0.9 \times 10^6 - 18$ kips ESAL over a 20 year design period was utilized for the pavement design of all streets in the Minnetex Area and Almeda Genoa Place project area. This traffic volume is based on assumed traffic of average daily traffic (ADT) volume of 1,500 vehicles for all the streets in the project area. A distribution of 96% passenger cars, 3.5% light trucks and 0.5% heavy trucks were assumed for all the streets in the project area.

Other Design Parameters. Other design parameters used in the development of rigid pavement thickness are given below:

Material Properties of Concrete:

Modulus of Elasticity of Concrete (E_c): 4,100,000 psi

Mean value of Modulus of Rupture of Concrete after 28 days

(S'c): 600 psi (based on compressive strength of 3,500 psi)

Load Transfer coefficient (J): 2.7

Drainage coefficient (C_d): 1.2

Overall Standard Deviation (S_o): 0.35

Reliability Level (R): 95%

Serviceability Index

Initial (P_0): 4.5

Terminal (P_t): 2.25

Reinforcement Variables

Allowable Working Stress (f_s): 45,000 psi (grade 60 steel)

Friction Factor (F): 1.8

5.4.2 Recommended Pavement Section

Based on the design parameters described above and the AASHTO design procedures, the thickness of rigid pavement was determined. The recommended pavement section is given below:

Pavement, Course	Thickness, inches
Reinforced Concrete	7
6% Lime-stabilized subgrade	6

Based on the reinforcement variables and recommended pavement section, the required longitudinal and transverse reinforcing steel (No. 4, Grade 60 Steel) can be determined for 7-inch concrete pavement per Table 1 of City of Houston Drawing No. 02751-01 (Revised July 1, 2009).

5.4.3 Preparation of Pavement Subgrade

Based on the field and laboratory test data, the subgrade soils at the finished grade of the project site consists of high to very high plasticity fat clay and medium plasticity lean clay w/sand

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and sandy lean clay. These soils have medium to high volume change potential. Hence, lime stabilization of the clay subgrade will be required to reduce the swell potential of clay subgrade due to volume changes and to accelerate the construction and provide a stable subgrade on which to construct the pavement section. The subgrade soils should be stabilized with approximately 6 percent lime to a depth of at least 6 inches. This corresponds to approximately 28 pounds of hydrated lime per square yard based upon a soil dry unit weight of 103 pcf. It should be noted that quantity of lime was calculated based on the dry unit weight determined from the specific boring locations only.

Subgrade preparation for the proposed pavement after removing the existing pavement should consist of stripping, proof-rolling, and stabilization. The following procedures for subgrade preparation are recommended:

- 1. Strip the surficial soils to a suitable depth to remove all surficial vegetation and achieve grade. In isolated areas where soft, compressible, or very loose soils are encountered, additional stripping may be required. Stripping should extend to a minimum of 2 feet in the adjacent open (unpaved) area, where it exists beyond the edge of the proposed pavement.
- 2. After stripping, the exposed surface should be proof-rolled with a minimum of 3 passes of a 30-ton pneumatic-tired roller or a partially loaded truck utilizing a tire pressure of approximately 90 psi. If rutting develops, the tire pressure should be reduced. The purpose of the proof-rolling operation is to identify any underlying zones or pockets of soft soils so these weak materials can be removed and replaced.
- 3. Lime stabilization of cohesive subgrade should be performed in accordance with City of Houston Standard Specification No. 02336, "Lime-Stabilized Subgrade."

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Groundwater Control

Excavations for the water line, sanitary sewer and storm sewer may encounter groundwater seepage to varying degrees depending upon the groundwater conditions at the time of construction and the location and depth of the trench. Based on the soil conditions identified in the borings for the proposed sanitary sewer and storm sewer installation, all the excavations will be in cohesive soils. In general for cohesive soils as encountered in all the borings (for the excavation depths), the groundwater (if encountered) may be managed by collection in excavation bottom sumps for pumped disposal. It is recommended that the actual groundwater conditions should be verified by the contractor at the time of construction and that groundwater control should be performed in general accordance with the City of Houston Standard Specifications, Section 01578.

7.0 LIMITATIONS

The description of subsurface conditions and the design information contained in this report are based on the soil borings made at the time of drilling at specific locations. However, some variation in soil conditions may occur between soil borings. Should any subsurface conditions other than those described in our boring logs be encountered, Geotest should be immediately notified so that further investigation and supplemental recommendations can be provided. The depth of the groundwater level may vary with changes in environmental conditions such as frequency and magnitude of rainfall. The stratification lines on the log of borings represent the approximate boundaries between soil types, however, the transition between soil types may be more gradual than depicted.

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ILLUSTRATIONS

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Symbols and Abbreviations Used on Boring Log Profile	4
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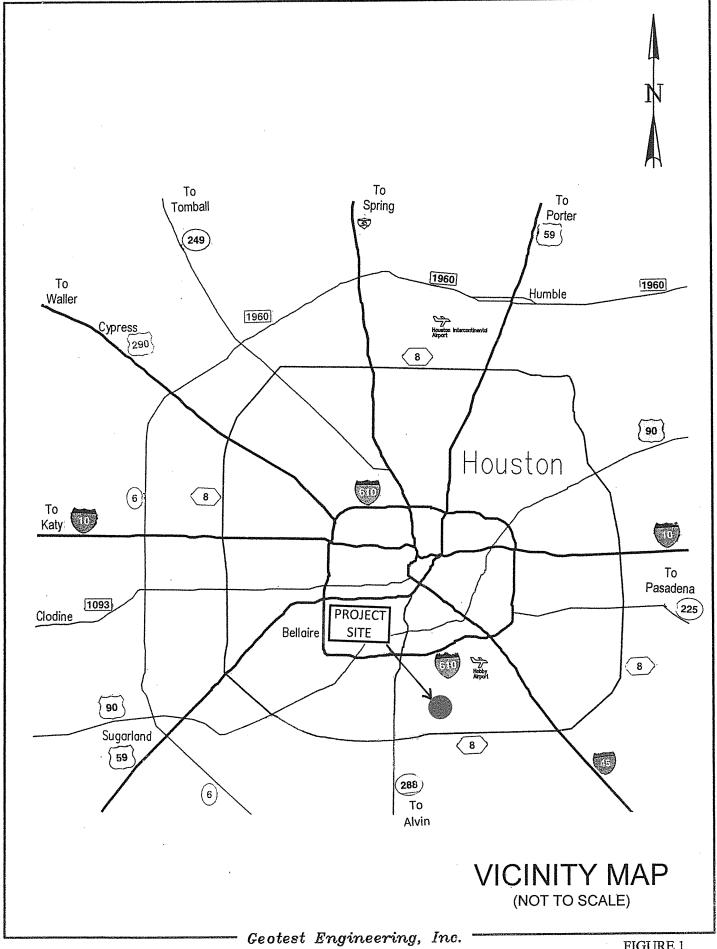
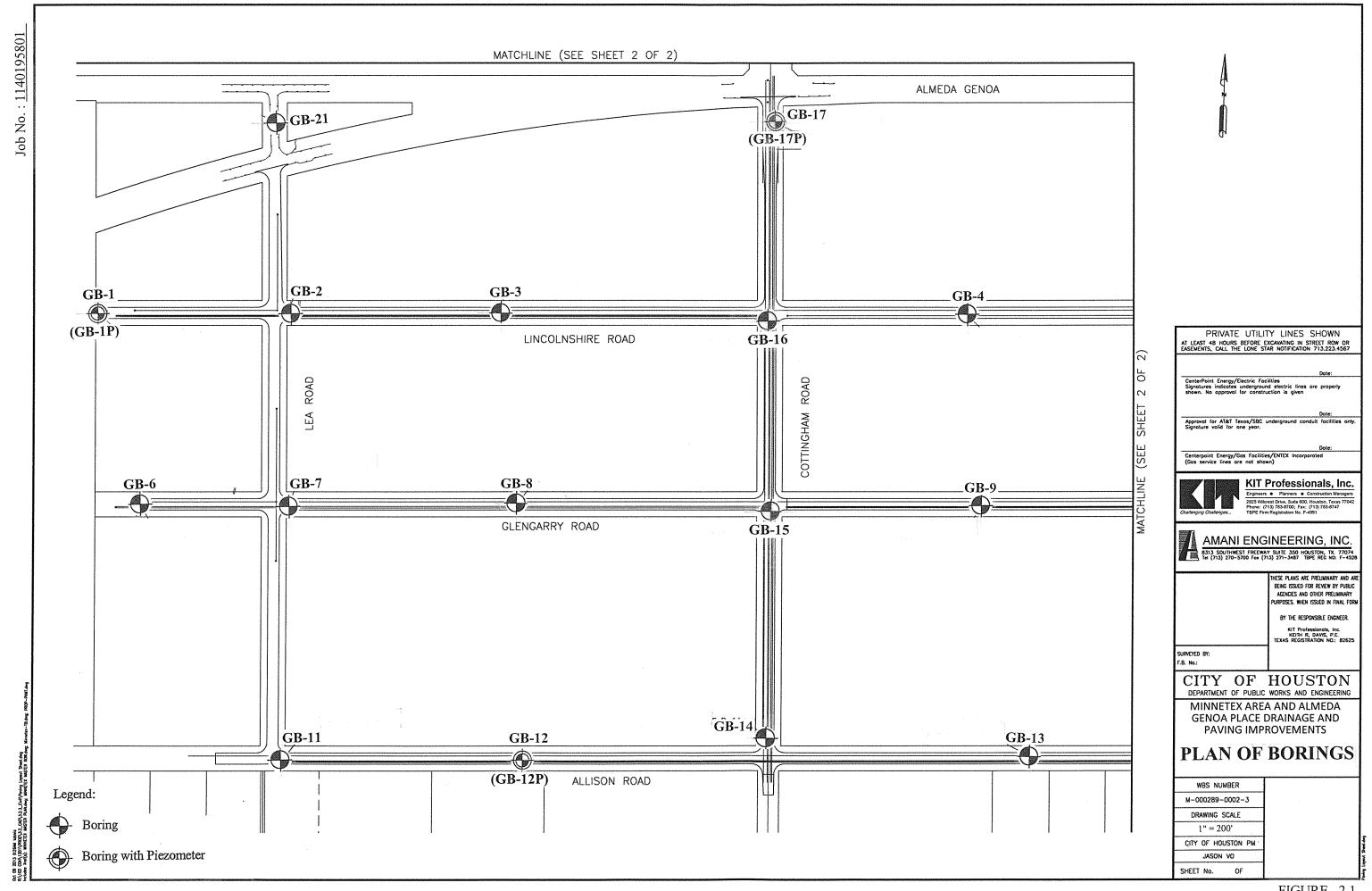
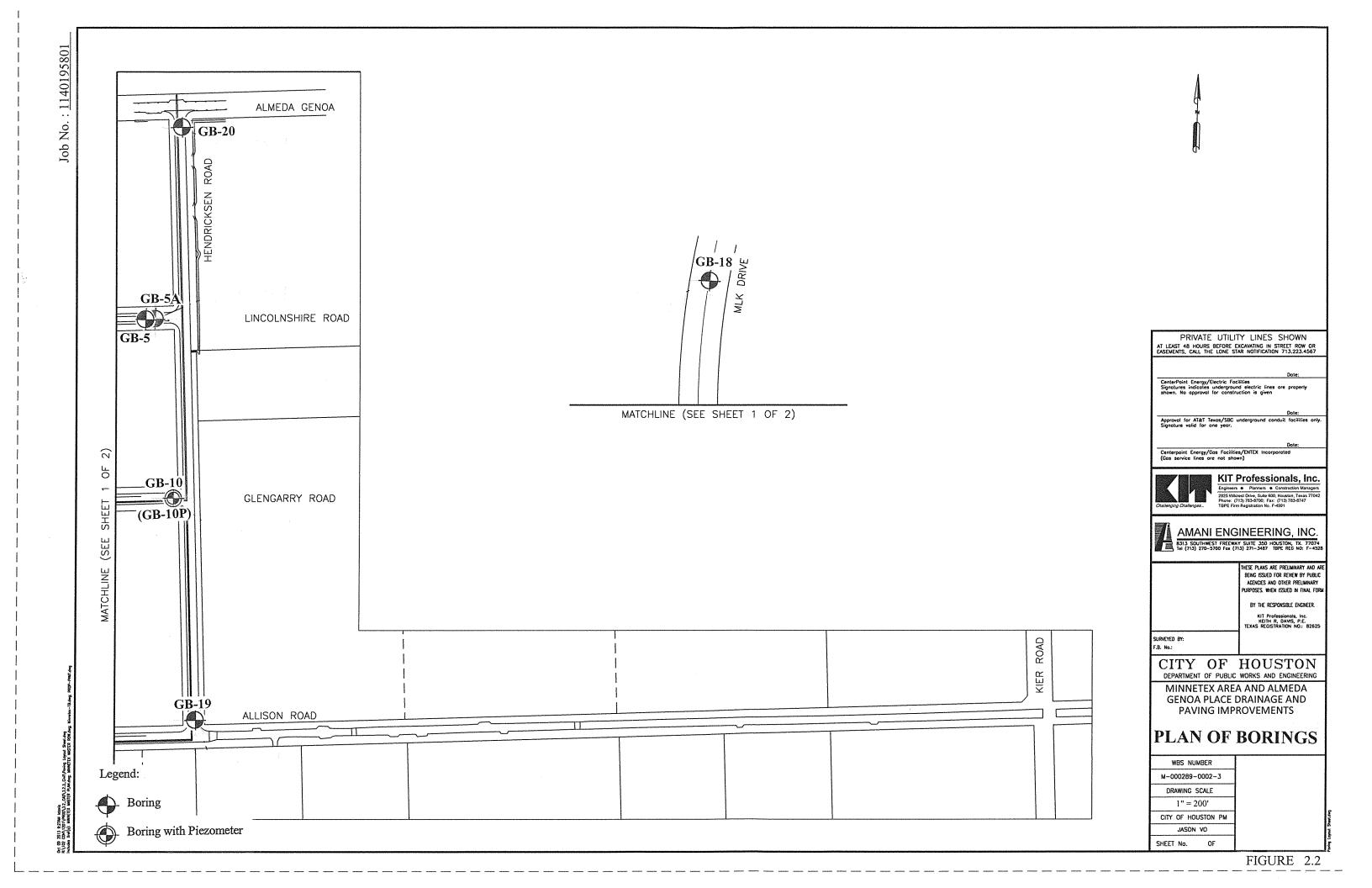


FIGURE 1





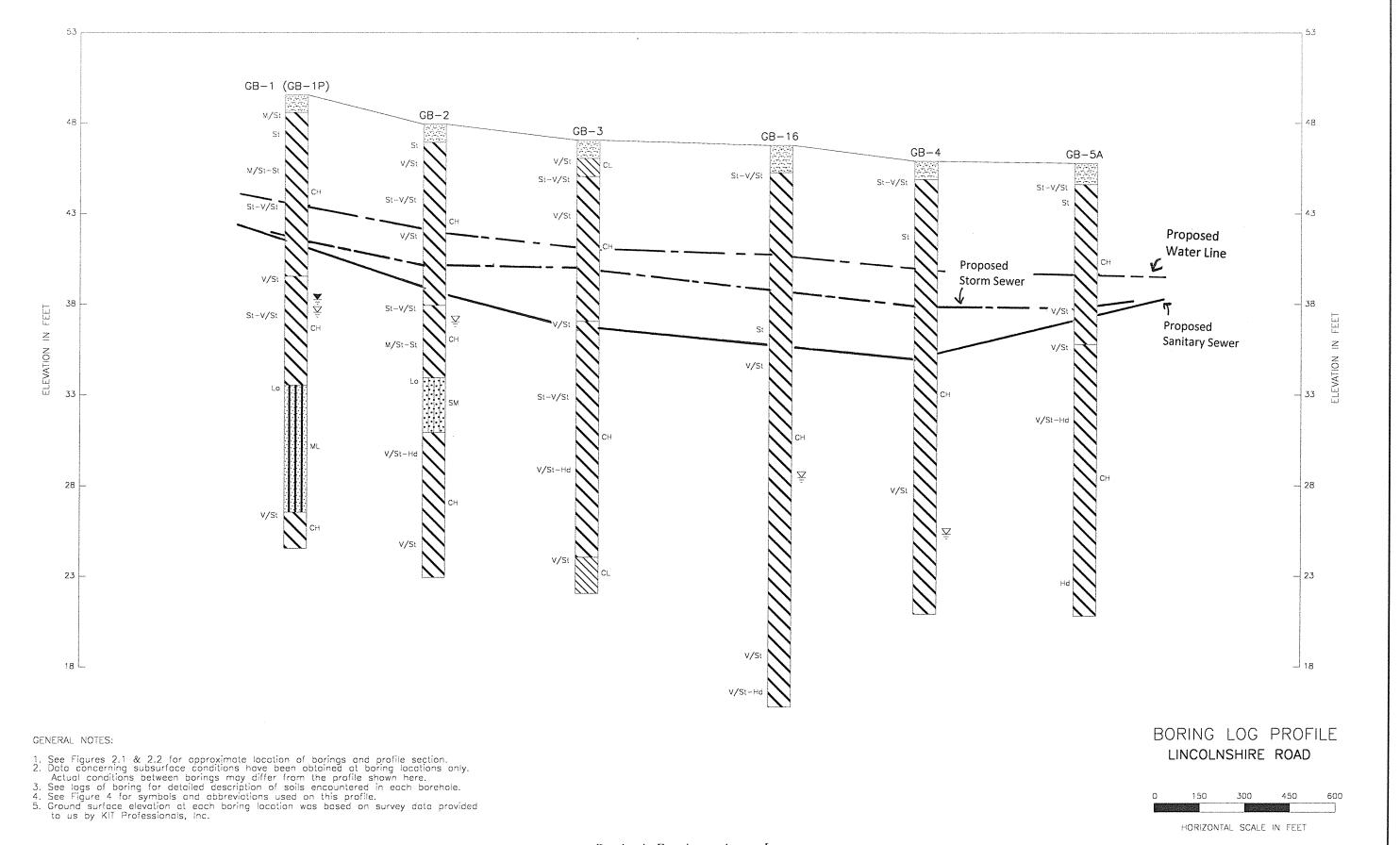
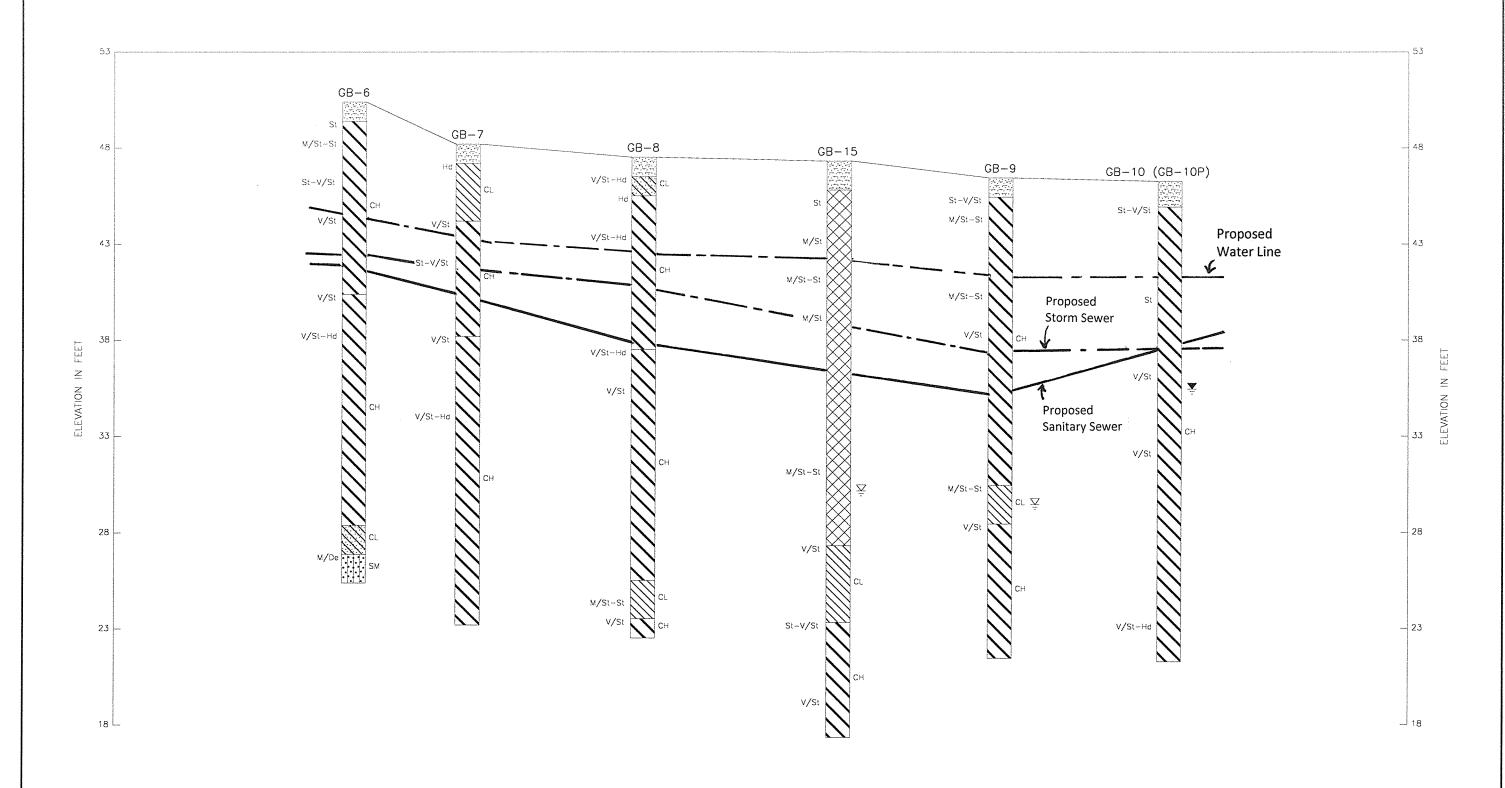


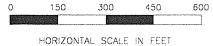
FIGURE 3.1

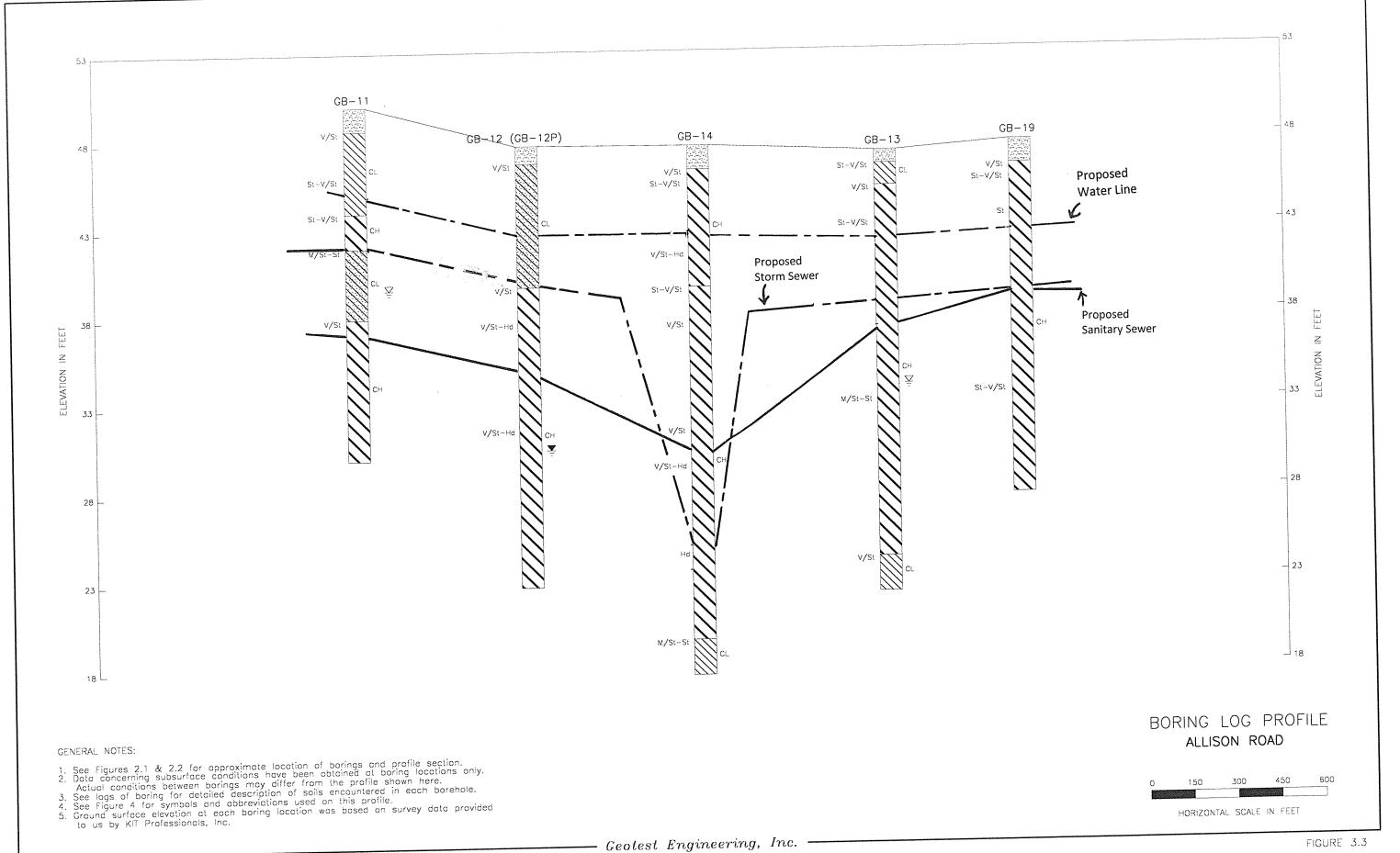


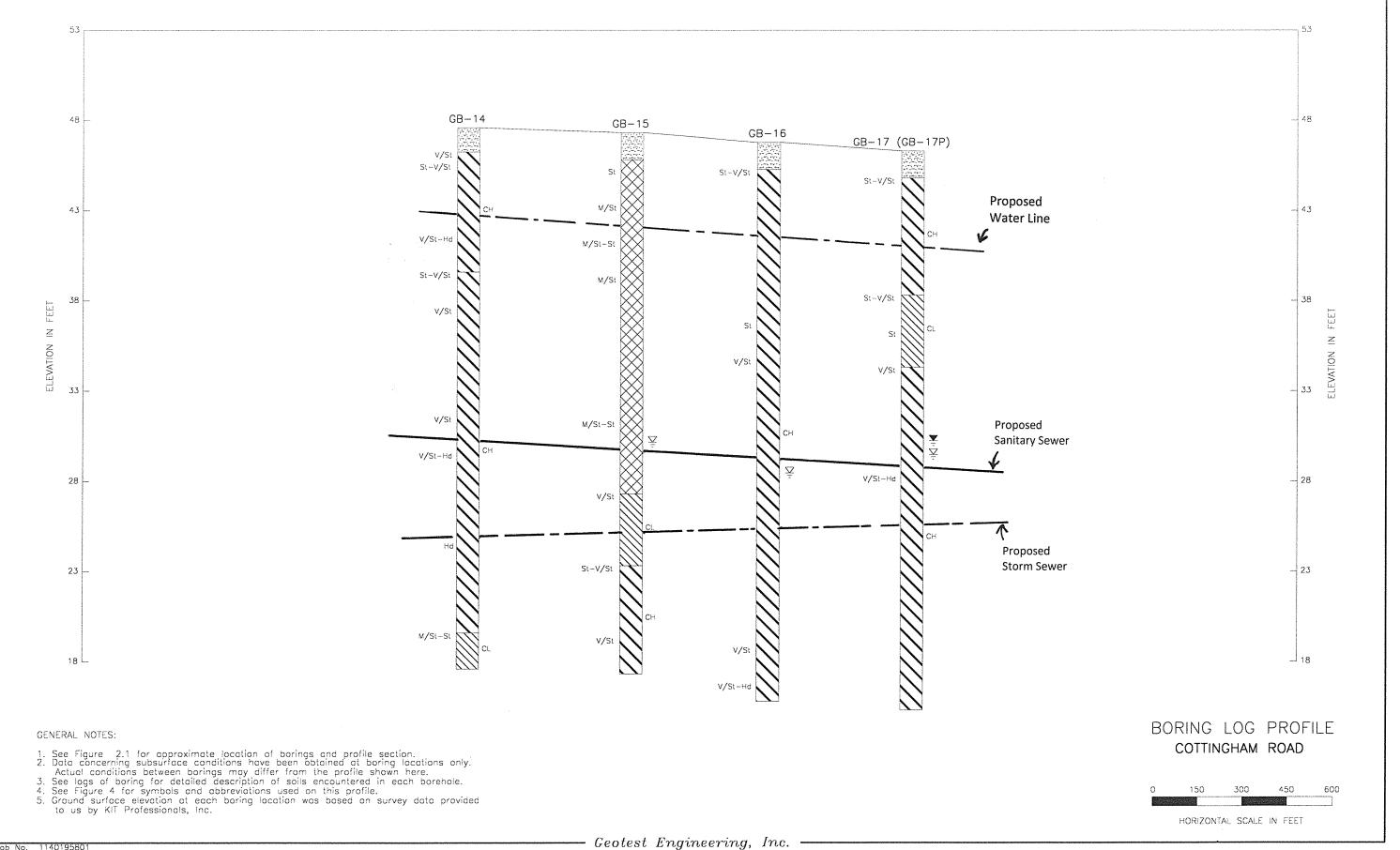
GENERAL NOTES:

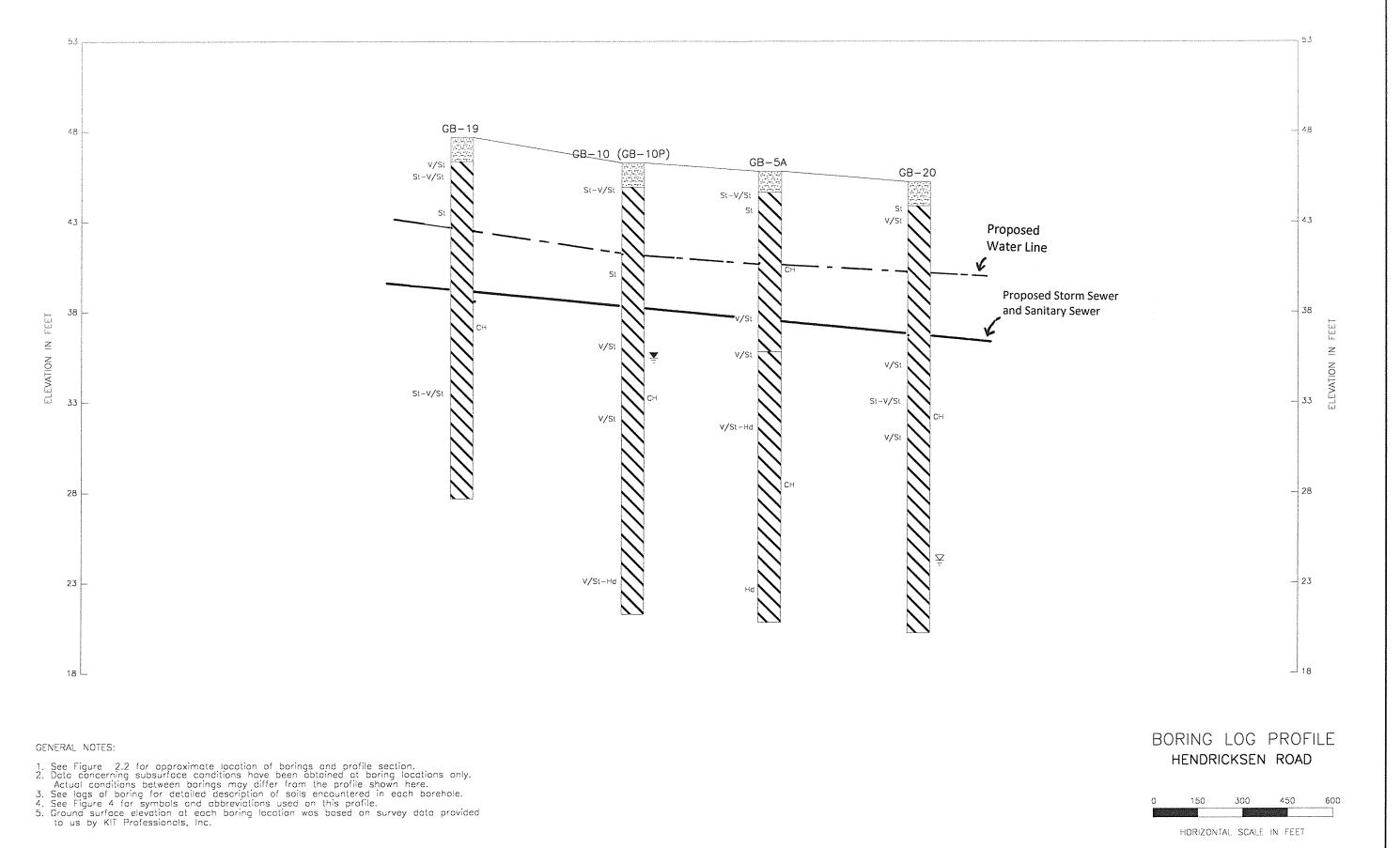
- See Figures 2.1 & 2.2 for approximate location of borings and profile section.
 Data concerning subsurface conditions have been obtained at boring locations only.
 Actual conditions between borings may differ from the profile shown here.
 See logs of boring for detailed description of soils encountered in each borehole.
 See Figure 4 for symbols and abbreviations used on this profile.
 Ground surface elevation at each boring location was based on survey data provided to us by KIT Professionals, Inc.

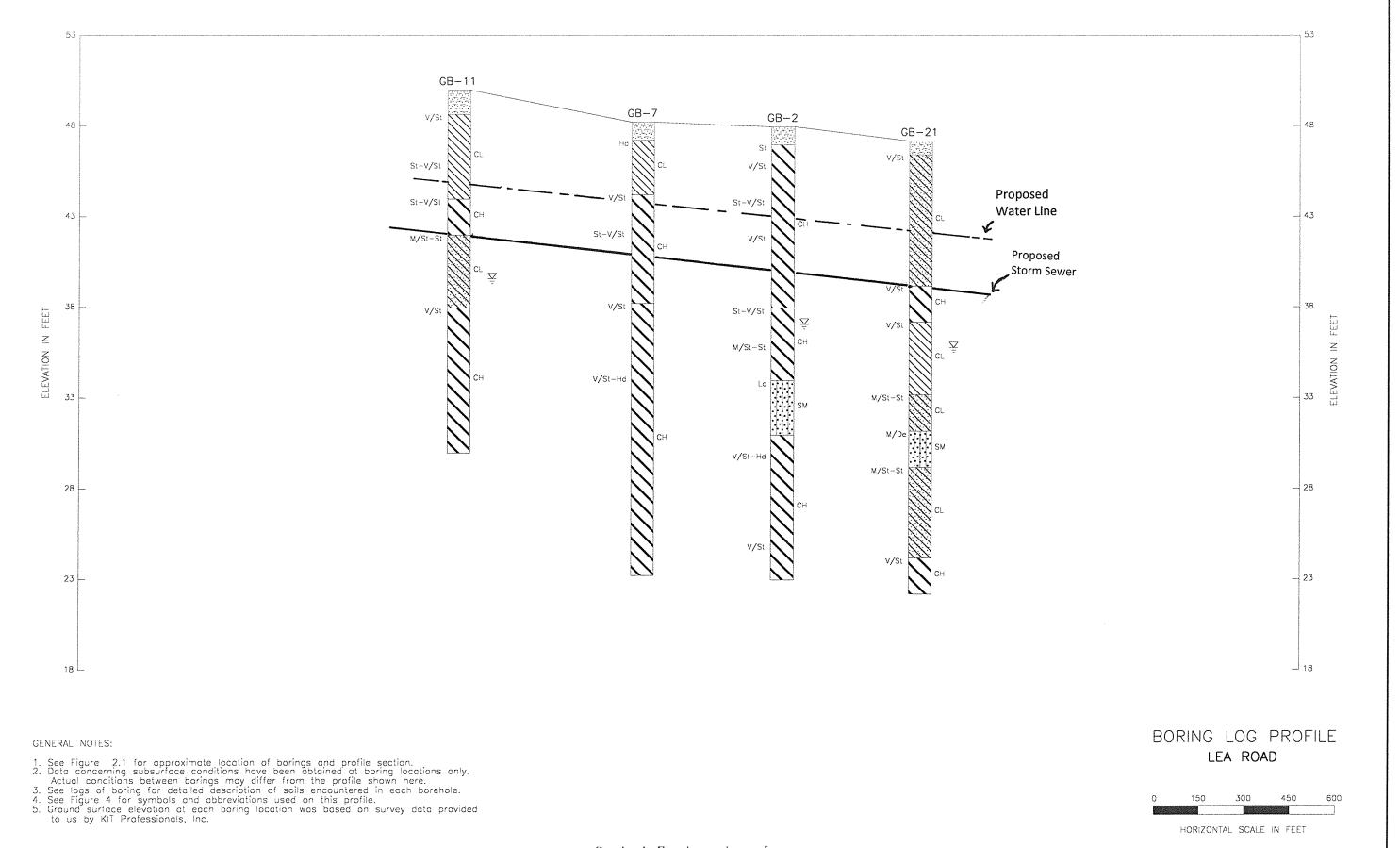
BORING LOG PROFILE GLENGARRY ROAD





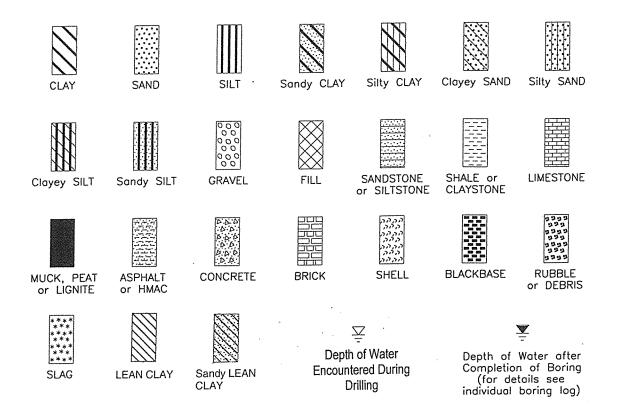






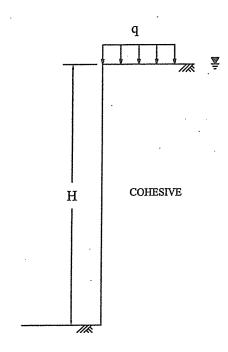
SYMBOLS AND ABBREVIATIONS USED ON BORING LOG PROFILE

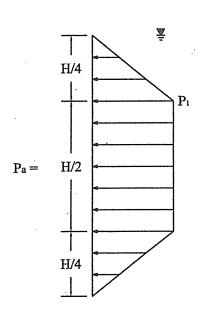
LEGEND

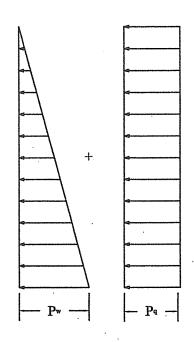


ABBREVIATIONS USED FOR CONSISTENCY/DENSITY

 COHESIONEESS SOIFS
 V/Lo : Very Loose Lo : Loose S/Co : Slightly Compact Co : Compact M/De : Medium Dense De : Dense V/De : Very Dense







TYPICAL SOIL PARAMETERS

See Table 2 for typical values of soil parameters

BRACED WALL

For γH/c ≤4

 $P_1 = 0.3 \gamma_c' H$ $P_w = \gamma_w H = 62.4 H$ $P_q = 0.5 q$

Where:

 γ_c ' = Submerged unit weight of cohesive soil, pcf;

 γ_{w} = Unit weight of water, pcf;

q = Surcharge load at surface, psf;

 $\hat{P}_a = \text{Lateral pressure, psf;}$

 P_1 = Active earth pressure, psf;

 P_q = Horizontal pressure due to surcharge, psf;

Pw = Hydrostatic pressure due to groundwater, psf;

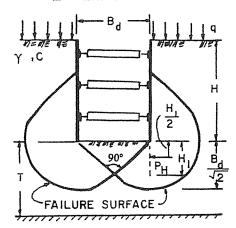
H = Depth of braced excavation, feet

c = Shear strength of cohesion soil, psf;

TRENCH SUPPORT EARTH PRESSURE

SUBMERGED COHESIVE SOIL

CUT IN COHESIVE SOIL, DEPTH OF COHESIVE SOIL UNLIMITED (T>0.7 B_d) L = LENGTH OF CUT



If sheeting terminates at base of cut:

Safety factor,
$$F_s = \frac{N_c C}{v H + a}$$

 N_C = Bearing capacity factor, which depends on dimensions of the excavation :

B_d, L and H (use N_C from graph below)

C = Undrained shear strength of clay in failure zone beneath and surrounding base of cut

 γ = Wet unit weight of soil (see Table 2)

q = Surface surcharge (assume q = 500 psf)

If safety factor is less than 1.5, sheeting or soldier piles must be carried below the base of cut to insure stability - (see note)

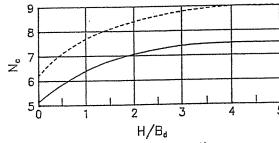
$$H_1$$
 = Buried length = $\frac{B_d}{2} \ge 5$ feet

Note: If soldier piles are used, the center to center spacing should not exceed 3 times the width or diameter of soldier pile.

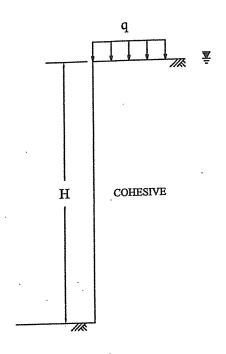
Force on buried length, PH:

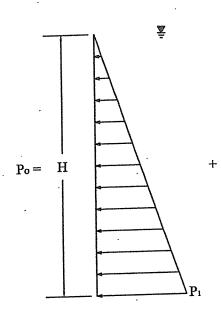
If
$$H_1 > \frac{2}{3} \frac{B_d}{\sqrt{2}}$$
, $P_H = 0.7 (\gamma HB_d - 1.4CH - \pi CB_d)$ in lbs/ linear foot

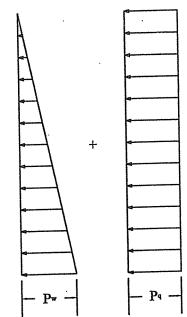
If
$$H_1 < \frac{2}{3} \frac{B_d}{\sqrt{2}}$$
, $P_H = 1.5H_1 (\gamma H - \frac{1.4CH}{B_d} - \pi C)$ in lbs/linear foot



For trench excavations For square pit or circle shaft STABILITY OF BOTTOM FOR BRACED CUT







TYPICAL SOIL PARAMETERS

See Table 2 for typical values of soil parameters

 $K_{oc} = 1.0$

PERMANENT WALL

$$P_1 = K_{\infty} \gamma_c! H$$

 $P_w = \gamma_w H = 62.4 H$
 $P_q = 0.5 q$

Where:

 γ_c ' = Submerged unit weight of cohesive soil, pcf;

 K_{∞} = Coefficient of at-rest earth pressure in cohesive soil;

 γ_w = Unit weight of water, pcf;

q = Surcharge load at surface, psf;

P_o = Lateral pressure, psf;

 P_1 = At-rest earth pressure, psf;

P_q = Horizontal pressure due to surcharge, psf;

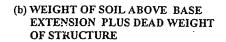
Pw = Hydrostatic pressure due to groundwater, psf;

H = Depth of excavation, feet

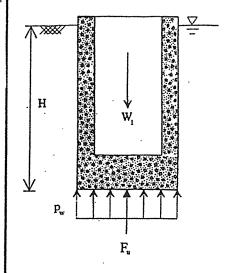
LATERAL EARTH PRESSURE DIAGRAM FOR PERMANENT WALL

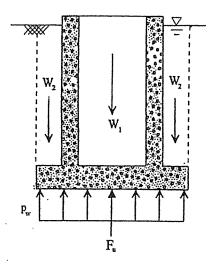
SUBMERGED COHESIVE SOIL

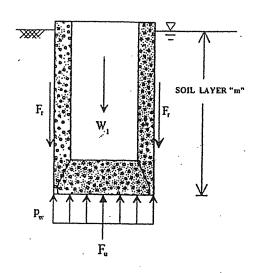
(a) DEAD WEIGHT OF STRUCTURE



(c) SOIL-WALL FRICTION PLUS DEAD WEIGHT OF STRUCTURE







$$p_w = H\gamma_w$$

$$P_w = H\gamma_w$$

$$p_w = H\gamma_w$$

$$F_u = A_b P_w$$

$$F_u = A_b P_w$$

$$F_u = A_b P_w$$

$$\frac{W_1}{S_f} = F_1$$

$$\frac{W_1}{S_{f_1}} + \frac{W_2}{S_{f_2}} = F_u$$

$$\frac{W_1}{S_{f_1}} + \frac{F_r}{S_{f_3}} = F_u$$

See Table 2 for typical values of soil parameters

Predominantly Cohesive Soils, $F_r = \alpha c_m A_m$ Predominantly Cohesionless Soils, $F_r = p_m A_m K \tan \delta_m$

Where: A_b = area of base, sq. ft.

A_m = cylindrical surface area of layer "m", sq. ft.

c_m = undrained cohesion of soil layer "m", psf.

 F_u = hydrostatic uplift force, lbs.

F_r = frictional resistance, lbs. H = height of buried structure, ft.

K = coefficient of lateral pressure = 0.5.

 p_m = average overburden pressure for layer "m," psf.

p_w = hydrostatic uplift pressure, psf.

 $S_{f_1, 2} = factor of safety.$

 $W_1^{1, 2, 3}$ = dead weight of concrete structure, lbs.

 W_2 = weight of backfill above base extension, lbs.

 α = cohesion reduction factor = 0.5.

 $\delta_{\rm m}$ = friction angle between soil layer "m" and concrete wall, degrees = 0.75 $\phi_{\rm m}$

 $\phi_{\rm m}$ = internal angle of friction of soil layer "m", degrees.

 γ_w = unit weight of water = 62.4 pcf.

UPLIFT PRESSURE AND RESISTANCE

TABLES

	<u> 1 abie</u>
Summary of Boring Information	1
Geotechnical Design Parameter Summary – Open Cut Excavation	2

TABLE 1
SUMMARY OF BORING INFORMATION

Boring No.	Depth (feet)	Street	Northing	Easting	Elevation (feet)
GB-1 (GB-1P)	25	LINCOLNSHIRE	3129627.2726	13792624.9524	49.55
GB-2	25	LINCOLNSHIRE	3130087.2086	13792638.5094	47.94
GB-3	25	LINCOLNSHIRE	3130593.7160	13792652.1646	47.06
GB-4	25	LINCOLNSHIRE	3131717.0874	13792678.7612	45.91
GB-5A	25	LINCOLNSHIRE	3132246.8970	13792693.1056	45.80
GB-6	25	GLENGARRY	3129741.1573	13792166.8724	50.39
GB-7	25	GLENGARRY	3130099.1195	13792174.4801	48.20
GB-8	25	GLENGARRY	3130646.8397	13792192.8060	47.52
GB-9	25	GLENGARRY	3131763.6159	13792221.2548	46.45
GB-10 (GB-10P)	25	GLENGARRY	3132292.7453	13792237.0772	46.27
GB-11	20	ALLISON	3130101.6697	13791564.7876	49.97
GB-12 (GB-12P)	25	ALLISON	3130684.6716	13791581.6161	47.67
GB-13	25	ALLISON	3131900.0083	13791621.0170	47.19
GB-14	30	COTTINGHAM	3131264.0053	13791648.3166	47.59
GB-15	30	COTTINGHAM	3131258.7773	13792191.8887	47.32
GB-16	31	COTTINGHAM	3131235.0439	13792649.0115	46.78
GB-17 (GB-17P)	31	COTTINGHAM	3131240.9951	13793129.4289	46.31
GB-18	32	COTTINGHAM	3131246.8570	13793588.4001	44.60
GB-19	20	HENDRICKSEN	3132355.7845	13791671.8124	47.69
GB-20	25	HENDRICKSEN	3132317.1862	13793183.7042	45.22
GB-21	25	LEA	3130040.1153	13793095.0361	47.16

TABLE 2
GEOTECHNICAL DESIGN PARAMETER SUMMARY
OPEN-CUT EXCAVATION

Alignments	Boring Nos.	Stratigraphic Unit	Range of Depths, ft	Wet Unit Weight, γ, pcf	Submerged Unit Weight, γ', pcf	Undrained Cohesion, psf	Internal Friction Angle, φ, degree
Water line,	GB-1	Cohesive	0-2	126	63	500	
Storm			2-6	125	63	1,000	
Sewer and			6-10	120	60	1,500	
Sanitary			10-16	126	63	2,000	
Sewer		Cohesionless	16-23	104	52		25
Along		Cohesive	23-25	125	63	2,000	
Lincolnshire	GB-2	Cohesive	0-2	123	62	600	
			2-12	120	60	1,800	
			12-14	120	60	500	
		Cohesionless	14-17	106	53		25
		Cohesive	17-25	125	63	2,800	
	GB-3	Cohesive	0-14	118	59	1,000	
	thru		14-25	125	63	1,500	
	GB-5A		25-31	125	63	2,000	
	and GB-		(GB-16				
	16		only)				
Water line,	GB-6	Cohesive	0-6	128	64	1,200	
Storm			6-23.5	123	62	2,200	
Sewer and Sanitary		Cohesionless	23.5-25	110	55		30
Sewer along	GB-7	Cohesive	0-8	125	63	800	
Glengarry	thru		8-16	130	65	1,600	
	GB-10		16-18	125	63	1,000	
			18-25	126	63	1,200	
	GB-15	Fill	0-6	125	63	1,500	
			6-20	120	60	500	
		Cohesive	20-22	125	63	2,500	
			22-30	125	63	1,200	
Water line,	GB-11	Cohesive	0-6	115	58	1,500	
Storm	thru		6-10	115	58	1,000	
Sewer and	GB-14		10-14	120	60	1,500	
Sanitary	and GB-		14-16	125	63	500	
Sewer along	19		16-20	126	63	1,200	
Allison			20-25	125	63	2,200	
			25-28	125	63	400	
			(GB-14				
		-	only)				
			28-30	125	63	500	
			(GB-14				
			only)				
Water line,	GB-14.	Cohesive	0-12	123	62	1,200	
Storm	GB-16		12-20	125	63	1,800	
Sewer and	and GB-		20-28	126	63	1,500	
Sanitary	17		28-31	125	63	500	
Sewer along	GB-15	Fill	0-6	125	63	1,500	
Cottingham			6-20	120	60	500	
		Cohesive	20-22	125	63	2,500	
			22-30	125	63	1,200	

TABLE 2 GEOTECHNICAL DESIGN PARAMETER SUMMARY **OPEN-CUT EXCAVATION**

Alignments	Boring Nos.	Stratigraphic Unit	Range of Depths, ft	Wet Unit Weight, γ, pcf	Submerged Unit Weight, γ', pcf	Undrained Cohesion, psf	Internal Friction Angle, φ, degree
Water line,	GB-18	Cohesive	0-8	112	51	3,100	
Storm]		8-12	120	60	1,200	
Sewer and			12-14	125	63	800	
along MLK			14-32	125	63	2,000	
Water line,	GB-5A,	Cohesive	0-8	123	63	1,000	
Storm	GB-10,		8-14	130	65	1,600	
Sewer and	GB-19		14-25	124	62	1,600	
Sanitary	and GB-						
Sewer along	20						
Hendricksen							
Water line,	GB-2	Cohesive	0-2	123	62	600	
Storm			2-12	120	60	1,800	
Sewer and			12-14	120	60	500	
Sanitary		Cohesionless	14-17	106	53		25
Sewer along		Cohesive	17-25	125	63	2,800	
Lea					***************************************		
	GB-7	Cohesive	0-6	125	63	1,600	
	and GB-		6-12	130	65	1,000	
	11		12-20	125	63	1,200	
			20-25	126	63	2,100	
			(GB-7				
			only)				
	GB-21	Cohesive	0-14	130	65	2,000	
			14-16	125	63	800	
		Cohesionless	16-18	110	55		30
		Cohesive	18-20	120	60	500	
L			20-25	125	63	3,000	

Note:1) Fill soils include lean clay with sand and fat clay with wood and shell fragments
2) Cohesive soils include Fat Clay, Fat Clay with sand, Lean Clay, Lean Clay with sand and Sandy Lean

³⁾ Cohesionless soils include Silty Sand and Sandy Silt.

APPENDIX A

	<u>Figure</u>	
Log of Borings	4-1 thru A-	21
Symbols and Terms Used on Boring Logs	A-22	
Piezometer Installation Report.	4-23 and A	-26

PROJECT No. : 114C Proving Improvements WBS No. M-000289-0002-3; Houston, Texas LOCATION : N 13792624.95, E 3129627.27 SURFACE ELEVATION : 49.55 FT. SURFACE ELEVATION : 49.55 FT. SAMPLER : Shelby Tube/Split Spoon DRY AUGER : 0.0 TO 16.0 FT. WET ROTARY : 16.0 TO 25.0 FT. DESCRIPTION OF MATERIAL DESCRIPTION OF MATERIAL ABSOLUTE Medium stiff dark gray FAT CLAY (CH) w/sand and calcareous nodules -stiff 2'-4' -w/ferrous nodules 2'-10' -medium stiff to stiff 4'-6' -stiff to very stiff brown and gray w/ferrous stains 6'-10' Very stiff reddish brown FAT CLAY (CH) -w/calcareous nodules 10'-12' -stiff to very stiff 12'-14' -w/cloy stone seams 12'-16' Loose brown SANDY SILT (ML) PROJECT NO. : 114C COMPLETION DEPTH : COMPLETION DEPTH : COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston, Texas COMPLETION DEPTH : DATE : 07-22-13 Unionance she R No. M-000289-0002-3; Houston Depth she R No. M-000289-00	EAR STRENGTH, SF PROMETER COMPRESSION ATED—UNDRAINE MPRESSION
3.5" Asphalt over 8" Sand Shell Base Medium stiff dark gray FAT CLAY (CH) w/sand and calcareous nodules -stiff 2'-4' -w/ferrous nodules 2'-10' -medium stiff to stiff 4'-6' -stiff to very stiff brown and gray w/ferrous stains 6'-10' Very stiff reddish brown FAT CLAY (CH) -w/calcareous nodules 10'-12' -stiff to very stiff 12'-14' -w/cloy stone seams 12'-16' 99 100 26 81 29 52	SF ROMETER COMPRESSION ATED—UNDRAINE MPRESSION
3.5" Asphalt over 8" Sand Shell Base Medium stiff dark gray FAT CLAY (CH) w/sand and calcareous nodules -stiff 2'-4' -w/ferrous nodules 2'-10' -medium stiff to stiff 4'-6' -stiff to very stiff brown and gray w/ferrous stains 6'-10' Very stiff reddish brown FAT CLAY (CH) -w/calcareous nodules 10'-12' -stiff to very stiff 12'-14' -w/cloy stone seams 12'-16' 99 100 26 81 29 52	
Very stiff brown FAT CLAY (CH) w/calcareous nodules NOTE: See Piezometer GB-1P for water level measurements.	

PR(OJECT :	Paving Improvements			GB-	nd	······································	PRO	JEC ⁻	Г NO. :	114019	15801
LOC	CATION :	WBS Ño. M-000289-0002-3; Houston, N 13792638.51, E 3130087.21 Lincolnshire; See Plan of Borings (Figur LEVATION: 47.94 FT.	Tex: e 2.	as .1)						TION DE 07-23-	PTH : 2	.5.0 F
	The state of the s	SAMPLER : Shelby Tube/Split Spoon			SHT,	URE	88	%	ж	UNDRAINE	ED SHEAR TSF PENETROMI	
ELEVATION, FEET	DEPTH, FEET SYMBOL	DRY AUGER: 0.0 TO 16.0 FT. WET ROTARY: 16.0 TO 25.0 FT.	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT,	PLASTIC LIMIT,	PLASTICITY INDEX,	O UNCO	NFINED COM NSOLIDATED AL COMPRE	MPRESSI
- 47.9-		DESCRIPTION OF MATERIAL	STANDA TEST, E	PER	DRY	NATUR	LIQU	PLA	PLAST	Δ TORVA 0.5 1	NE .0 1.5 2	2.0 2.
- 46.9-		8" Asphalt over 4" Shell and Sand Base			107	22						
		Stiff dark gray FAT CLAY (CH) w/sand and ferrous stains				24						
	- 5-	-very stiff 2'-4' -stiff to very stiff 4'-6' -w/calcareous and ferrous		85	100	25	66	23	43			
		nodules 4'-10' -gray 6'-8' -very stiff 6'-10'		e per e a management de la prima de la		18						
37.9-	10	-brown and gray 8'-10' Stiff to very stiff reddish				19						
		brown FAT CLAY (CH) w/calcareous and ferrous nodules		94	102	24	56	22	34			7
33.9-	- 15-11	-medium stiff to stiff 10'-12' Loose brown SILTY SAND (SM)				27				ΔΦ		
30.9-		Reddish brown FAT CLAY (CH)	8	44		24						
		w/sand seams and ferrous stains -very stiff to hard 18'-20'	14			27						
	- 20-		,									
		-very stiff brown, slickensided w/calcareous										
22.9	- 25	nodules 23'-25'				25						
Acceptance of the second	- 30-											
-												
1	- 35-					***************************************						
Ā. DEbli	H TO WAT	ER IN BORING : TER 1st ENCOUNTERED AT 15.0 FT. DURING DRI	11.1.161			20.0			10.			

		LOG OF BORIN	G N	10.	GB-	-3				
	,	Minnetex Place and Almeda Genoa Place Paving Improvements WBS No. M-000289-0002-3; Houston, N 13792652.17, E 3130593.72 Lincolnshire; See Plan of Borings (Figu VATION : 47.06 FT.	Των	ae.	ge o	ind		COM	IPLE	NO. : 1140195801 TION DEPTH : 25.0 FT.
		SAMPLER : Shelby Tube/Split Spoon	·		GHT,	URE	%	%	1%	UNDRAINED SHEAR STRENGTH, TSF O HAND PENETROMETER
	ELEVATION, FEET DEPTH, FEET SYMBOL SAMDLES		STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT,	PLASTIC LIMIT,	LASTICITY INDEX,	UNCONFINED COMPRESSION UNCONSOLIDATED—UNDRAINED TRIAXIAL COMPRESSION
- 4	년 47.1 0	DESCRIPTION OF MATERIAL 8" Asphalt over 4" Sand and	STANG TEST,	A.	NO N	NAT	LIC	J.	PLA	\(\text{\text{\$\}\$}}}}\$}}}}}}}}}}}}}}}}}}}}}}}}}}}}}
	45.1	Shell Base Very stiff dark gray LEAN CLAY (CL) w/sand			103	22	35	17	18	<u> </u>
	- 5-	Stiff to very stiff dark gray FAT CLAY (CH) w/sand, calcareous and ferrous				26 21				
		nodules —gray 4'—6' —very stiff 4'—8' —yellow and gray 6'—8'		85	108	21	57	23	34	
- 3	37.1 10	-w/ferrous stains 6'-10' -gray and brown 8'-10' Very stiff reddish brown				21				
		FÁT CLAY (CH) w/sand seams and ferrous stains —w/calcareous nodules 10'—12'				25 27				
	- 15-	—stiff to very stiff, slickensided 14'—16'		100	98	29	74	27	47	
		-very stiff to hard 18'-20'				24	RESERVATION OF THE SECOND			
	- 20-					29				
- 2	24.1	Very stiff reddish brown								
- 2	22.1 25	LÉAN CLAY (CL) w/sand, calcareous and ferrous nodules				22				
	- 30-		PERSONAL PROPERTY AND A PERSON							
	- 35-									
		R IN BORING: ATER ENCOUNTERED DURING DRILLING. O 25.0 FT. AT END OF DRILLING. ———————————————————————————————————	eeri	ng.	In	ıc.				

PROJECT	: 4	LOG OF BORIN Minnetex Place and Almeda Genoa Place						PRO	JECT	Г NO. :	1140)1958	01
	1	Paving Improvements WBS No. M—000289—0002—3; Houston, N 13792678.76, E 3131717.09 Lincolnshire; See Plan of Borings (Figu VATION : 45.91 FT.	Tov	~~	90 .	,0		СОМ	PLE.	TION DEI	⊃TH		
GG CEEVATION, FEET GO DEPTH, FEET	SYMBOL SAMPI FS	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 25.0 FT. WET ROTARY: TO FT. DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINE O HAND UNCON UNCON TRIAXIA A TORVAN 0.5 1	PENETF IFINED ISOLIDA IL COM	ROMETER COMPRI TED-UN PRESSIO	R ESSI NDRA DN
- 44.9		8" Asphalt over 4" Sand and Shell Base Stiff to very stiff dark gray FAT CLAY (CH) w/ferrous stains -stiff w/sand seams 4'-6' -yellow and gray 6'-8'		93	88	31 30 33	84	30	54	0	Δ		
- 10-		-yellow and gray 6-8 -w/ferrous nodules 6'-12' -yellow and brown 8'-10' -w/calcareous nodules and ferrous stains 8'-12' -w/silt seams 10'-12' -reddish brown 10'-18'	AND			30 29 30				0	А Д		
- 15-		-slickensided 14'–16'		100	98	33 29 31	74	27	47	0	04	,	
- 20-		-very stiff gray and brown 18'-25' -w/silt layer 23'-24'				21	The second secon						
20.9 25				99		26	67	25	42		ΟΔ		
- 30- - 35-													

LOG OF BORING	N	Ο.	GB-	-5								
PROJECT: Minnetex Place and Almeda Genoa Place Paving Improvements WBS No. M—000289—0002—3; Houston, T LOCATION: N 13792693.11, E 3132246.90 Lincolnshire; See Plan of Borings (Figure SURFACE ELEVATION: 45.80 FT.			ge c	and		COM	IPLE	TION DE	РТН			Т.
	20	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %		ED SHE TSF PENETF NFINED NSOLIDA AL COM	COMPI	er Ressioi	N
DESCRIPTION OF MATERIAL 45.8- 44.8 8" Asphalt over 4" Sand and Shell Base FILL: 20" sand NOTE: Hit hard obstruction at 2'7" and boring was offset to GB-5A.	STAN	Add and the state of the state	ja	NAT	The state of the s	14	4)d	O.5	NE .0 1.5	5 2.0	2.5	
DEPTH TO WATER IN BORING: NO GROUNDWATER ENCOUNTERED DURING DRILLING. HOLE OPEN TO 2.7 FT. AT END OF DRILLING. Geotest Engineer					THE PROPERTY OF THE PROPERTY O				1			

PROJECT: Minnetex Place and Almeda Genoa F Paving Improvements WBS No. M-000289-0002-3; Houst LOCATION: N 13792693.11, E 3132246.90 Lincolnshire; See Plan of Borings (F SURFACE ELEVATION: 45.80 FT. SAMPLER: Shelby Tube/Split Spoon	on, Te		ge c	ind		PRO	JECT	NO.: 1140195801
WBS No. M-000289-0002-3; Houst LOCATION: N 13792693.11, E 3132246.90 Lincolnshire; See Plan of Borings (F SURFACE ELEVATION: 45.80 FT. SAMPLER: Shelby Tube/Split Spoon	igure 2	kas 2.2)						
SAMPLER : Shelby Tube/Split Spoon		2.2)				СОМ	PLE	TION DEPTH : 25.0 FT
SAMPLER : Shelby Tube/Split Spoon	ATION					DATE	: '	07-25-13
HI L ION MICEO CO TO CE O ET		S S L	Ë.	RE		%	%	UNDRAINED SHEAR STRENGTH
변 급	ENETR	PASS	UNIT WEIGHT,	IOISTU IT, %	LIMIT, %	LIMIT,	INDE	O HAND PENETROMETER • UNCONFINED COMPRESSION
DRY AUGER: 0.0 TO 25.0 FT. WET ROTARY: TO FT. DESCRIPTION OF MATERIAL	ARD P	PERCENT PASSING NO. 200 SIEVE	L S	NATURAL MOISTURE CONTENT, %	רוסחום רוו	PLASTIC 1	LASTICITY INDEX,	UNCONSOLIDATED-UNDRAIN TRIAXIAL COMPRESSION
	STANDARD PENETRATION		DRY	NATU	Ę	P.LA	PLAS	△ TORVANE 0.5 1.0 1.5 2.0 2.5
6" Asphalt over 8" Sand and Shell Base	Н							
Stiff to very stiff gray FAT CLAY (CH) w/sand			104	21	64	25	39	
-stiff 2'-4'	ever distance in the second			27				
- w/ferrous nodules 2'-12'				25				
-yellow and gray 6'-8' -w/calcareous nodules 6'-10'				25				
-w/ferrous stains 6'-12' -very stiff 8'-10'		83	102	24	65	25	40	
35.8 10	Carrier anniversal ann			23				
Very stiff reddish brown and gray FAT CLAY (CH)		-		7.4				
w/ferrous stains -w/calcareous and ferrous		-		34				
nodules 10'-12' -w/silt layer 12'-12'2"	-			16				
- slickensided 12'-14' -very stiff to hard 14'-16'				28				
-reddish brown w/silt seams 14'-25'	- Constitution of the Cons							
-slickensided 16'-18'		100	96	30	72	27	45	
- 20-				29		e de la constante de la consta		
-hard 23'-25'						***************************************		
				34				
20.8 25				21				
- 30-						-		
		***************************************			-			
- 35-					-			
DEPTH TO WATER IN BORING : NO GROUNDWATER ENCOUNTERED DURING DRILLING.			•h					
HOLE OPEN TO 25.0 FT. AT END OF DRILLING. Geotest Eng	ineer	ina	I_{Υ}	.c.				***************************************

Γ					LOG OF BORIN	G N	10.	GB	-6									
	PRO	DJECT	:		finnetex Place and Almeda Genoa Plac Pavina Improvements	e Dr	aina	ge d	and		PRO	JEC1	NC). :	114	0195	5801	
	LOC	CATIO	N :	N	/BS Ňo. M-000289-0002-3; Houston, ! 13792166.87 F 3129741.16						COM	IPLE	TION	DEF	PTH	: 25	5.0 f	FT.
	SUF	Paving Improvements WBS No. M-000289-0002-3; Houston, Texas No. M-000289-0002-3; Houston, Texas SURFACE ELEVATION: 50.39 FT. SURFACE ELEVATION: 50.39 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 22.0 FT. WET ROTARY: 22.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 6" Asphalt over 6" Sand and Shell Base Stiff gray FAT CLAY (CH) W/sand and ferrous stains -medium stiff to stiff 2'-4' -w/calcareous nodules 2'-8' -stiff to very stiff 4'-6' -very stiff w/ferrous nodules 6'-10' -gray and brown 8'-10' Very stiff reddish brown FAT CLAY (CH) w/silt seams, ferrous stains and calcareous nodules -very stiff to hard 12'-14' -slickensided 14'-16' Reddish brown SANDY LEAN CLAY (CL) w/clayey sand seams																
	SURFACE ELEVATION: 50.39 for of Borings (Figure 2.1) SURFACE ELEVATION: 50.39 for one of the property of the		L0	№	UND	RAINE	D SHI	EAR S	TREN	ЗТН,								
	SURFACE ELEVATION: 50.39 FT. SURFACE ELEVATION: 50.39 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 22.0 FT. WET ROTARY: 22.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 50.4 6" Asphalt over 6" Sand and Shell Base Stiff gray FAT CLAY (CH) W/sand and ferrous stains - medium stiff to stiff 2"-4" - w/ calcareous nadules 2"-8" - stiff to very stiff 4"-6" - very stiff w/ferrous nodules 6"-10" - gray and brown 8"-10" Very stiff reddish brown FAT CLAY (CH) W/silt seams, ferrous stains and calcareous nadules - very stiff to hard 12"-14" - slickensided 14"-16" 28.4 Reddish brown SANDY LEAN CLAY (CL) w/clayey sand seams Medium dense reddish brown SILTY SAND (SM) w/clay seams DEPTH TO WATER IN BORING:	NSTUR	F. %		NDEX,						i O b i							
	VTION,	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 22.0 FT. WET ROTARY: 22.0 TO 25.0 FT. DESCRIPTION OF MATERIAL OH ASPHAIT OVER 6" Sand and Shell Base Stiff gray FAT CLAY (CH) W/sand and ferrous stainsmedium stiff to stiff 2'-4'w/calcareous nodules 2'-8'stiff to very stiff 4'-6'very stiff w/ferrous nodules 6'-10'gray and brown 8'-10' Very stiff reddish brown FAT CLAY (CH) w/silt seams, ferrous stains and calcareous nodulesvery stiff to hard 12'-14'slickensided 14'-16' Reddish brown SANDY LEAN CLAY (CL) w/clayey sand seams Medium dense reddish brown SILTY SAND (SM) w/clay seams 18	ENT 200	P P	AL MC	D) <u>1</u>	CITY	_									
	LOCATION: N 13792166.87, E 3129741.16 Glengarry; See Plen of Borings (Figure 2.1) SURFACE ELEVATION: 50.39 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 22.0 FT. WET ROTARY: 22.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 50.4 6" Asphalt over 6" Sand and Shell Base Stiiff gray FAT CLAY (CH) W/sand and ferrous stains -medium stiff to stiff 2"-4" -w/calcareous nodules 2"-8" -stiff to very stiff 4"-6" -very stiff w/ferrous nodules 6"-10" gray and brown 8"-10" 40.4 10 Very stiff reddish brown FAT CLAY (CH) w/silt seams, ferrous stains and colcareous nodules -very stiff to hard 12"-14" -slickensided 14"-16" 28.4 Reddish brown SANDY LEAN CLAY (CL) w/clayey sand seams 25.4 26.9 Reddish brown SANDY LEAN CLAY (CL) w/clayey sand seams Medium dense reddish brown SILTY SAND (SM) w/clay seams DEPTIH TO WATER IN BORING: NO GROUNDWATER ENCOUNTERED DURING DRILLING. HOLE OPEN TO 25.0 FT. AT END OF DRILLING. HOLE OPEN TO 25.0 FT. AT END OF DRILLING.	DRY	NATUR	רומחו	PLAS	PLASTI	Δ 1	ORVAN	ΝE									
F		- 0-							1.7	***************************************								
					Stiff gray FAT CLAY (CH)				'/									
		DRY AUGER: 0.0 TO 22.0 FT. WET ROTARY: 22.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 6" Asphalt over 6" Sand and Shell Base Stiff gray FAT CLAY (CH)				24				С								
	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 22.0 FT. WET ROTARY: 22.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 6" Asphalt over 6" Sand and Shell Base Stiff gray FAT CLAY (CH) Wysand and ferrous stains -medium stiff to stiff 2'-4' -w/calcareous nodules 2'-8' -stiff to very stiff 4'-6' -very stiff w/ferrous nodules 6'-10' -gray and brown 8'-10' Very stiff reddish brown FAT CLAY (CH) w/silt seams, ferrous stains and calcareous nodules -very stiff to hard 12'-14' -slickensided 14'-16' 98 10 Reddish brown SANDY LEAN CLAY (CL) w/clayey sand seams Medium dense reddish brown SILTY SAND (SM) w/clay seams 18 32	407	0.1		0.7	7.4		_										
SAMPLER : Shelby Tube/Split Spoon Shell Spoon Shell Spoon Shell Base Stiff gray FAT CLAY (CH) W/sond and ferrous stains -medium stiff to stiff 2'-4' -w/calcareous nodules 2'-8' -stiff to herd 12'-14' -slickensided 14'-16' -15 -15 -20 -20 -28.4 -26.9 -25.4 -25.4 -26.9 -25.4 -2	∠3	34			4													
COATION : N : 13792166.87, E 312974.16 Figure 2.1)	Δ																	
SAMPLER : Shelby Tube/Split Spoon DRY AUGER : 0.0 TO 22.0 FT. WET ROTARY : 22.0 TO 25.0					Δ0	D												
ſ	40.4-	- 10-																
					seams, ferrous stains and				24						Δ)		
					-very stiff to hard 12'-14'				27							0		
		- 15-			SHOKEHSIACA 14 10													
							98	101	22	59	23	36				Δ		1
									19						40			l
																		l
		- 20-							22						(8)			
6" Asphalt over 6" Sand and Shell Base Stiff gray FAT CLAY (CH)										l								
-stiff to very stiff 4'-6' -very stiff w/ferrous nodules 6'-10' -gray and brown 8'-10' Very stiff reddish brown FAT CLAY (CH) w/silt seams, ferrous stains and calcareous nodules -very stiff to hard 12'-14' -slickensided 14'-16' 20 AO AO AO AO AO AO AO AO AO A																		
_	25.4	- 25-		X		18	32		20									
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		- 35-												I	L1	I	1	
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<u> </u>						eeri	ina	Īγ	ıc.	***************************************								
					ocoest Bright		9	, , ,	J.J.									

	LOG OF BORIN	G N	0.	GB-	-7							
LOCATION	Minnetex Place and Almeda Genoa Plac Paving Improvements WBS No. M—000289—0002—3; Houston, N 13792174.48, E 3130099.12 Glengarry at Lea; See Plan of Borings VATION : 48.20 FT.	Tex	as	-	ind		СОМ	PLE	TION 1	DEPTH		
SE ELEVATION, FEET DEPTH, FEET SYMBOL SAMPIFS	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 25.0 FT. WET ROTARY: TO FT. DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	O HAI UN TRI TOI	ND PEN CONFINE CONSOL AXIAL C RVANE 1.0	ETROME D COM DATED OMPRE	TER IPRESSI -UNDRA SSION
47.2	8" Asphalt over 4" Sand and Shell Base Hard dark gray LEAN CLAY (CL) w/sand and ferrous stains Very stiff dark gray FAT CLAY (CH) w/sand, calcareous and ferrous nodules and ferrous stains -stiff to very stiff yellow and gray 6'-8' -gray and reddish brown 8'-10'		84	113	15 16 20 20	47 53	17	30			40	Ø () <u>A</u>
- 15- - 20-	Very stiff reddish brown FAT CLAY (CH) w/silt seams, calcareous nodules and ferrous stains -very stiff to hard 14'-16' -slickensided 16'-18'		98	104	29 26 22 25	66	25	41		С		Δ
- 30-	-brown 23'-25'				28							

				LOG OF BORIN	G N	10.	GB-	-8				
PRO	DJECT	:	P	linnetex Place and Almeda Genoa Place laving Improvements			ge d	and		PRO	JECT	NO.: 1140195801
LOC	CATION	٧:	N	/BS Ño. M-000289-0002-3; Houston, 1 13792192.81, E 3130646.84 Hengarry; See Plan of Borings (Figure 'ATION: 47.52 FT.								TION DEPTH : 25.0 FT
5UF	YFACE	. EL	EV	ATION: 47.52 FT.	,	, 	T	I .		DAII	T	07-26-13 UNDRAINED SHEAR STRENGTH
ELEVATION, FEET	оертн, геет	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 25.0 FT. WET ROTARY: TO FT. DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	TSF O HAND PENETROMETER UNCONFINED COMPRESSION UNCONSOLIDATED - UNDRAIN TRIAXIAL COMPRESSION A TORVANE 0.5 1.0 1.5 2.0 2.5
47.5 - 46.5-	- 0	777		6" Asphalt over 6" Sand and 7 Shell Base								
45.5				Very stiff to hard dark gray SANDY LEAN CLAY (CL) w/calcareous nodules				13				Δ Δ ΔΟ
na an airtean ann Airtean an mar beach	- 5-			Hard dark gray FAT CLAY (CH) w/sand, calcareous and ferrous nodules and ferrous stains		83	112	16	61	24	37	O4 •
37.5	- 10-			-very stiff to hard 4'-6' -gray and brown 6'-8' -reddish brown 8'-10'				16 17				40
Annual description of the second seco				Very stiff to hard reddish brown FAT CLAY (CH) w/silt seams -slickensided 10'-12' -very stiff 12'-20'		AND THE PROPERTY OF THE PROPER	***************************************	26				<u> </u>
	- 15-			-slickensided 16'-18'			om ist skyletiniskykstekterskyksterstrommenter	26 29				24
						99	99	26	70	26	44	
25.5	- 20-			Reddish brown LEAN CLAY				28				
23.5 22.5	- 25			(CL) w/silt seams -medium stiff to stiff 23'-24'				25				
	- 30-			Very stiff reddish brown FAT CLAY (CH) w/sand seams								
	- 35-											
NO	GRO	JNDV	VA1	IN BORING: FER ENCOUNTERED DURING DRILLING. 25.0 FT. AT END OF DRILLING. ———————————————————————————————————	eeri	ing.	ΙΥ	ic.				

PROJECT :	LOG OF BORING Minnetex Place and Almeda Genoa Plac Paving Improvements	e Dr	aina				PRO	JEC ⁻	Γ NO. : 1	114019	5801
LOCATION : SURFACE EL	WBS No. M-000289-0002-3; Houston, N 13792221.26, E 3131763.62 Glengarry; See Plan of Borings (Figure EVATION: 46.45 FT.	Tex(os .						TION DEP 07-26-1		:5.0 FT
DEPTH, FEET SYMBOL	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 25.0 FT. WET ROTARY: TO FT. DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED HAND P UNCONF UNCONS TRIAXIAL TORVANE 0.5 1.0	ENETROMI INED COM OLIDATED COMPRE	ETER MPRESSION -UNDRAIN SSION
- 45.5 - 5-	6" Asphalt over 6" Sand and Shell Base Stiff to very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/sand seams 1.5'-10' -medium stiff to stiff 2'-4' -w/ferrous nodules 4'-10' -medium stiff to stiff gray, slickensided 6'-8' -gray and brown 8'-10' -w/calcareous nodules and ferrous stains 8'-12' -very stiff 8'-16' -reddish brown w/silt seams 10'-16'		91	94	26 30 29 32 27 25	69	26	43		Δ Δ	
- 15- - 30.5 - 28.5 - 20- - 21.5 - 25- - 30-	Medium stiff to stiff gray LEAN CLAY (CL) w/ferrous stains Very stiff reddish brown FAT CLAY (CH) w/silt seams and ferrous stains —slickensided 18'-20' —w/silt layer 22'-23' —w/sand and silt seams 24'-25'		93	108	30 22 30 27	36	17	19		70	
DEPTH TO WATE ₹: FREE WATE HOLE OPEN	ER 1st ENCOUNTERED AT 22.0 FT. DURING DR	ILLING	G; AF	TER	20.0	лім с	I. AT	17.0	D FT.		

	********				LOG (OF BORIN	G N	10.	GB-	-10	(G	B- '	10P)				
10	OJEC [*] CATIO RFACI	NI ·	Pavi WBS N 1	netex Place ar ng Improveme No. M-00028 3792237.08, E garry; See Pla ON : 46.27 F	nts 39-0002-3 - 3132292	3; Houston, 75	Tex	as	ge o	and		СОМ	PLE ⁻	NO. TION [07-22	EPTI	⊣ : :		
ELEVATION, FEET	ОЕРТН, FEET	SYMBOL	SAMPLES	SAMPLER : Shell DRY AUGER : WET ROTARY : DESCRIPTIO	oy Tube/Spli 0.0 TO 2 TO N OF MATER	t Spoon 5.0 FT. FT.	STANDARD PENETRATION TEST, BLOWS PER FOOT		DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRA O HAN O UNC TRIA A TOR O.5	D PEN CONFIN CONSOI XIAL (VANE	TSF IETRON ED CO	ETER MPRES -UNDI	SION RAIN
- 44.9-			Si	Asphalt and Stiff to very signay FAT CLA seams and for w/colcareous w/ferrous no stiff slickensi	Shell Base tiff dark Y (CH) w, errous sta nodules dules 4'—	/sand ins 2'-4'		93	93	28 28 32 30	70	26	44	C				
	- 10-			reďdish browi	n 10'-25'		AND THE PROPERTY OF THE PROPER			30 30 28	Account to the second s							
	- 20-		-	slickensided [*]	16'–18'				107	29 16 33								
- 21.3-	6" Asphalt over 10" Sand, Asphalt and Shell Base Stiff to very stiff dark gray FAT CLAY (CH) w/sand seams and ferrous stains -w/calcareous nodules 2'-4' -w/ferrous nodules 4'-12' -stiff slickensided 6'-8' -gray 6'-10' -very stiff 10'-12' -reddish brown 10'-25' -very stiff 14'-23' -slickensided 16'-18'			22						0								

			LOG OF BORIN								
	ROJEC OCATIO JRFAC	}	Minnetex Place and Almeda Genoa Plac Paving Improvements WBS No. M—000289—0002—3; Houston, N 13791564.79, E 3130101.67 Allison at Lea; See Plan of Borings (Fi VATION : 49.97 FT.	Tev	ae		and		COM	IPLE	NO. : 1140195801 FION DEPTH : 20.0 FT 07-26-13
T G ELEVATION, FEET	DEPTH, FEET	SYMBOL SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH TSF ○ HAND PENETROMETER ■ UNCONFINED COMPRESSION ■ UNCONSOLIDATED—UNDRAIN TRIAXIAL COMPRESSION △ TORVANE 0.5 1.0 1.5 2.0 2.5
- 48.6 - 44.0	- 5-		4" Asphalt over 7" Asphaltic Shell over 5" Sand Base Very stiff dark gray LEAN CLAY (CL) w/sand, calcareous and ferrous nodules —stiff to very stiff yellow	A STATE OF THE STA		114	16 20	39	16	23	Φ Δ Φ
- 42.0 - 38.0	- 10-		and gray w/ferrous stains 4'-6' Stiff to very stiff gray and brown FAT CLAY (CH) w/sand Medium stiff to stiff reddish brown SANDY LEAN CLAY (CL) w/ferrous stains		78	110	20 22 25	52	21	31	04
	- 15-		-w/sand layer 8'-9' Very stiff reddish brown FAT CLAY (CH) w/silt seams, ferrous stains and calcareous nodules -slickensided 14'-16'		100	100	24 26 23	63	24	39	
- 30.0							29				
	- 30-										
ź	: FREE	WATER WATER PEN TO	IN BORING: R 1st ENCOUNTERED AT 12.0 FT. DURING DR D 20.0 FT. AT END OF DRILLING. ———————————————————————————————————					AIM C	I. AT	10.4	FT.

			LOG OF BORING					(G					
LOC	CATIO	N :	Minnetex Place and Almeda Genoa Plac Paving Improvements WBS No. M—000289—0002—3; Houston, N 13791581.62, E 3130684.67 Allison; See Plan of Borings (Figure 2.1 VATION : 47.67 FT.	Tex		ge c	ind		СОМ	PLE.	T NO. : 1 TION DEPT 07-22-13	H : 2	
-2.7 ELEVATION, FEET	рертн, FEET	SYMBOL SAMPIFS	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED HAND PE UNCONFII UNCONSC TRIAXIAL TORVANE 0.5 1.0	NETROME NED COM ILIDATED- COMPRES	ETER IPRESS - UNDR/ SSION
46.7-	- 5-		9" Asphalt over 3" Sand and Shell Very stiff dark gray SANDY LEAN CLAY (CL) w/calcareous and ferrous nodules and ferrous stains -brown and gray 4'-8' Very stiff reddish brown		68	116	19 19 16	40	16	24		(A) (A) (A)	
	- 10- - 15-		FAT CLAY (CH) w/silt seams and ferrous stains -very stiff to hard 10'-14' -slickensided 10'-20' -very stiff to hard 16'-18'		100	95	23 25 24 29	78	28	50			0
	- 20-		-brown 23'-25'				30					0	
22.7	- 25- - 30-		NOTE : See Piezometer GB—12P for water level measurements.				31						
NO	GRO	UNDWA	R IN BORING : TER ENCOUNTERED DURING DRILLING. TH AT 17.3 FT., HOLE OPEN TO 25.0 FT. C										

COMPLETION DEPTH : 25	PR	PROJECT: Minnetex Place and Almeda Genoa Proving Improvements WBS No. M-000289-0002-3; Housto LOCATION: N 13791621.02, E 3131900.01 Allison; See Plan of Borings (Figure SURFACE ELEVATION: 47.19 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16'						PRO	JEC.	T NO. :	1140)1958C) 1		
SAMPLER: Snelby Tube/Spit Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL DESCRIPTION OF MATERIAL	LOG	Paving Improvements WBS No. M-000289-0002-3; Housto N 13791621.02, E 3131900.01 Allison; See Plan of Borings (Figure 2) URFACE ELEVATION: 47.19 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark groy LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains	Tex	as				CON	IPLE	TION DE	PTH :	: 25.0	F"		
3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' 10- 10- -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' 100 88 35 62 29 53 100 88 35 62 29 53 O△ 24 Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains	SUI	ROJECT: Minnetex Place and Almeda Genoa P Paving Improvements WBS No. M-000289-0002-3; Houston WBS No. M-0002-3002-3; Houston WBS No. M-0002-3002-3002-3; Houston WBS No. M-0002-3002-3002-3; Houston WBS No. M-0002-3002-3002-3; Houston WBS No. M-0002-30	,					DAT	::	07-25-	·13				
3" Aspholt over 6" Shell Bose 45.2 Stiff to very stiff dork gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dork gray FAT CLAY (CH) w/ferrous stains - w/calcareous nodules 2'-12' - stiff to very stiff 4'-10' - gray 4'-12' - w/ferrous nodules 6'-10' - 10- - reddish brown w/silt seams 12'-25' - medium stiff to stiff slickensided 14'-16' 100 88 35 82 29 53 Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains 24 24 27 27 26 66 25 41 □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	EVATION, FEET	ЕРТН, FEET	SYMBOL	DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT.	JARD PENETRATION BLOWS PER FOO	RCENT PASSING 10. 200 SIEVE	Y UNIT WEIGHT, PCF	URAL MOISTURE CONTENT, %			INDEX,	O HAND UNCON TRIAXI	PENETR NFINED NSOLIDA AL COMI	ROMETER COMPRES	SSIC
46.4 46.4 46.4 46.4 45.2 Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel 27				DESCRIPTION OF MATERIAL	STANG TEST,	g.	, a	NAT) I	Ч.	PLA			5 2.0	2.5
Very stiff dork gray FAT CLAY (CH) w/ferrous stains — w/calcareous nodules 2'-12' — stiff to very stiff 4'-10' — gray 4'-12' — w/ferrous nodules 6'-10' - 10- - reddish brown w/silt seams 12'-25' - medium stiff to stiff slickensided 14'-16' - 15- Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains	- 46.4-			Base Stiff to very stiff dark gray LEAN CLAY (CL)	on necessary or description is reserved where the second manner									7	
-groy 4'-12' -w/ferrous nodules 6'-10' -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' 100 88 35 82 29 53 □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □		Paving Improvements WBS No. M-000289-0002-3; Houst WBS No. M-000289-0002-3; Houst Alison; See Plan of Borings (Figure RFACE ELEVATION: 47.19 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains		87	97	26	66	25	41						
-reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' 100 88 35 82 29 53 Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains		WBS No. M-000289-0002-3; Houst CATION: N 13791621.02, E 3131900.01 Allison; See Plan of Borings (Figure RFACE ELEVATION: 47.19 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains		Vide illustration and the second seco		25									
12'-25' -medium stiff to stiff slickensided 14'-16' 15- 100 88 35 82 29 53 100 88 35 82 29 53 100 88 35 82 29 53 100 88 35 82 29 53 100 88 35 82 29 53		CATION: N 13791621.02, E 3131900.01 Allison; See Plan of Borings (Figure RFACE ELEVATION: 47.19 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains													
100 88 35 82 29 53 24.2 Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains 27		WBS No. M-000289-0002-3; Hour ATION: N 13791621.02, E 3131900.01 Allison; See Plan of Borings (Figur REACE ELEVATION: 47.19 FT. SAMPLER: Shelby Tube/Split Spoor DRY AUGER: 0.0 TO 18.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' - reddish brown w/silt seams 12'-25' - medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains - very stiff reddish brown LEAN CLAY (CL) w/ferrous stains - very stiff reddish brown LEAN CLAY (CL) w/ferrous stains	12'-25' -medium stiff to stiff				29				4				
Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains		WBS No. M-000289-0002-3; House ATION: N 13791621.02, E 3131900.01 Allison; See Plan of Borings (Figure Plan of Borings) SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' - reddish brown w/silt seams 12'-25' - medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains - very stiff reddish brown LEAN CLAY (CL) w/ferrous stains - very stiff reddish brown LEAN CLAY (CL) w/ferrous stains			100	88		82	29	53	40				
Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains		SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 18.0 FT. WET ROTARY: 18.0 TO 25.0 FT. DESCRIPTION OF MATERIAL 3" Asphalt over 6" Shell Base Stiff to very stiff dark gray LEAN CLAY (CL) w/sand, shell and gravel Very stiff dark gray FAT CLAY (CH) w/ferrous stains -w/calcareous nodules 2'-12' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10' -reddish brown w/silt seams 12'-25' -medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains					THE PROPERTY OF THE PROPERTY O								
- 30-		-w/calcareous nodules 2' -stiff to very stiff 4'-10' -gray 4'-12' -w/ferrous nodules 6'-10 -reddish brown w/silt sec 12'-25' -medium stiff to stiff slickensided 14'-16' Very stiff reddish brown LEAN CLAY (CL) w/ferrous stains	LĒAN CLAY (CL) w/ferrous				27					10			
- 30-															
	STREET, AND THE PROPERTY OF TH	- 30-	THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TRANSPORT OF THE PERSON NAMED IN COLUMN TWO IS NAMED IN THE PERSON NAMED IN THE PERSO												
- 35-	The second secon														

			LOG OF BORIN												
100	DJECT	N :	Minnetex Place and Almeda Genoa Place Poving Improvements WBS No. M-000289-0002-3; Houston, N 13791648.32, E 3131264.01 Cottingham; See Plan of Borings (Figur	Tex	as	ge c	ınd				T NO. TION (
SUF	WBS No. M-000289-0002-3; Houston N 13791648.32, E 3131264.01 Cottingham; See Plan of Borings (Fig. SURFACE ELEVATION: 47.59 FT. SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 30.0 FT. WET ROTARY: TO FT. DESCRIPTION OF MATERIAL 6" Asphalt over 10" Shell and Sand Base Very stiff dark gray FAT CLAY (CH) w/sand, ferrous nodules and ferrous stains -stiff to very stiff 2'-4' -gray 4'-6' -w/calcareous nodules and sand seams 4'-8' -very stiff to hard gray and brown 6'-8' Stiff to very stiff reddish brown FAT CLAY (CH) w/silt seams and ferrous stains -w/calcareous and ferrous nodules 8'-10' -very stiff 10'-14' -slickensided 14'-16' -very stiff to hard 18'-20' Medium stiff to stiff reddish brown LEAN CLAY Medium stiff to stiff reddish brown LEAN CLAY	1	1	1			DAT	Ξ:	07-25						
ELEVATION, FEET	ОЕРТН, FEET	SYMBOL	DRY AUGER: 0.0 TO 30.0 FT. WET ROTARY: TO FT.	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	O HAP UNC TRI TOF	ID PENE CONFINE CONSOLI XIAL CO VANE	TROME TROME D COM DATED- DMPRE	TER PRESS -UNDR SSION	OI All
47.6- 46.3-	- 0-			SE							0.5	1.0	1.5 2	.0 2.	5
40.3	- 5-		Very stiff dark gray FAT CLAY (CH) w/sand, ferrous nodules and ferrous stains -stiff to very stiff 2'-4'	Lance			20 23				C				
39.6-			-w/calcareous nodules and sand seams 4'-8' -very stiff to hard gray and brown 6'-8'	The second secon	75	111	17 16	51	21	30			0		
de en	- 10-		brown FAT CLAY (CH) w/silt seams and ferrous stains -w/calcareous and ferrous nodules 8'-10'				23 25					022			
							31					1			
in the state of th	- 15-		-very stiff 16'-18'		100	93	31	77	28	49					
and the second s			-very stiff to hard 18'-20'	To the day of the property of the control of the co			28					0			
e e e e e e e e e e e e e e e e e e e	- 20-		-hard w/calcareous nodules,				29								
	- 25-		slickensided 23-25		98		22	60	24	36				0	
17.6	- 30		reddish brown LEAN CLAY (CL) w/sand seams and				27				04				
	- 35-														_
NO	GRO	UNDV	VATER ENCOUNTERED DURING DRILLING.	-	-		-								-

PROJECT :	Paving Improvements WBS No. M-000289-0002-3; Houston, N 13792191.89. E 3131258.78	Tex	as	ge c	and		PRO	JECT					
SURFACE (Cottinghom; See Plan of Borings (Figure LEVATION: 47.32 FT.	2.	1)				DATE	Ξ: (27-	25-	13		
PELEVATION, FEET OEPTH, FEET AYMBOL	SAMPLER: Shelby Tube/Split Spoon SPRING DRY AUGER: 0.0 TO 22.0 FT. WET ROTARY: 22.0 TO 30.0 FT. DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT,	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UND O H O U	RAINE HAND H INCON INCON RIAXIA ORVAN	D SHE TS PENET FINED SOLIDA L COM	ROMET COMF ATED- MPRES	TER PRESS UNDR SION
45.8-	6" Asphalt over 12" Sand and Shell Base FILL: dark gray lean clay w/sand -w/shell, gravel and rock 1.5'-20' -stiff 2'-4' -medium stiff w/wood 4'-6' -fat clay 4'-20' -medium stiff to stiff 6'-8'				17 23 31				0	Q			
- 10-	-w/wood 8'-10' -medium stiff 8'-16' -w/wood 12'-16'		75	96	26 28 35	61	24	37		7			
- 15-	-w/shell layer 14'-18' -medium stiff to stiff 16'-18' -reddish brown 16'-20'				32 27 33								Manufacture de la Contraction
27.3 20	Very stiff reddish brown LEAN CLAY (CL) w/calcareous nodules and ferrous stains		98	107	20	45	22	23					
23.3	Stiff to very stiff reddish brown FAT CLAY (CH) w/shell fragments and ferrous stains -very stiff 28'-30'				30						0		entransista de la companya de la com
17.3 30					27	тетер верене верене на положения велене на подражения велене на подвеждения велене на подвеждения велене на по		en den papir, de cele persona de compansa de compansa de compansa de compansa de Compansa de Compansa de Compa				V 0	

			LOG OF BORIN										
	DJECT		Minnetex Place and Almeda Genoa Plac Paving Improvements WBS No. M-000289-0002-3; Houston, N 13792649.01, E 3131235.04 Cottingham; See Plan of Borings (Figur EVATION: 46.78 FT.	Tex	as	ge c	ind		СОМ	PLE.	T NO. :	PTH :	
300	KFACE	. ELE		T		<u> </u>			DATE	. :	07-25- UNDRAINE		STRENGTH
ELEVATION, FEET	ОЕРТН, FEET	SYMBOL	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 28.0 FT. WET ROTARY: 28.0 TO 31.0 FT. DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, ?	O HAND	PENETROM IFINED CO ISOLIDATEI IL COMPR	
- 46.8 -				STAN	O.	٥	N A	コ	Ф.	<u>5</u>			2.0 2.5
- 45.3-			6" Asphalt over 12" Shell and Clay Mix Stiff to very stiff dark gray FAT CLAY (CH)			:	25				0		
	- 5		w/ferrous stains -w/sand seams 18"-12'			93	29 30	69	26	43			
			-gray w/calcareous and ferrous nodules 6'-10'		93	96	29	75	28	47			
	- 10-		-stiff 10'-12' -reddish brown 10'-31'				29				0		
			-very stiff w/silt seams 12'-20'				31 28						
	- 15-						23					Ø2	
Z -							30	***************************************				0 4	
	- 20-						26						
	- 25-		-w/calcareous nodules 23'-25'		97	104	24	64	25	39			
			-very stiff 28'-30' -w/silt seams 28'-31'										
- 15.8	- 30-		-very stiff to hard 30'-31'				25	agraporation de la companya del companya del companya de la compan				0 A	4
	- 35-												
DEPTH 후 : HOI	TO FREE LE OF	WATEI WATE PEN T	R IN BORING: CR 1st ENCOUNTERED AT 28.0 FT. DURING DR CO 31.0 FT. AT END OF DRILLING. Ceotest Engine					AIM (I. AT	18.3	3 FT.		

LOC	CATIO	N .	WBS Ño. M-000289-0002-3; Houston, N 13793129.43, E 3131240.99 Cottingham;See Plan of Borings (Figure EVATION : 46.31 FT.								TION DE		31.0	F
ELEVATION, FEET C	DEPTH, FEET	SYMBOL	SAMPLER : Shelby Tube/Split Spoon	STANDARD PENETRATION TEST, BLOWS PER FOOT		UNIT WEIGHT,	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, % D	PLASTICITY INDEX, %	O7-22- UNDRAINI O HAND UNCOI	ED SHEA TSF PENETRO	OMETER COMPRES	SSIC
			DESCRIPTION OF MATERIAL	STANDA TEST, B	PER	DRY	NATUF	LIQU	PLAS	PLAST	△ TORVA	NE	2.0 2	
46.3- 44.8-	- 0-		6" Aspholt over 12" Sand and Shell Base											
1 1.0			Stiff to very stiff dark gray FAT CLAY (CH) w/sand seams and ferrous stains	POPPOVPOJETPOPPOVAŠELENI III ILAILAINIIII			21				0			
	- 5-		-w/ferrous nodules 6'-10'		86	104	22 24	55	22	33	a			
38.3-	- 10-		Stiff to very stiff brown and gray LEAN CLAY (CL) w/sand, ferrous stains and calcareous nodules				27				0			-
34.3			-stiff 10'-12'		82		21	36	19	17				
ned manufacture of the second	- 15-		FÁT CLAY (CH) w/ferrous stains —w/calcareous nodules				27			:			70	
	6" Asphalt over 12" Sand and Shell Base Stiff to very stiff dark gray FAT CLAY (CH) w/san seams and ferrous stains - 5 - w/ferrous nodules 6'-10' Stiff to very stiff brown and gray LEAN CLAY (CL) w/sand, ferrous stains and calcareous nodules - stiff 10'-12' Very stiff reddish brown FAT CLAY (CH) w/ferrous stains - w/calcareous nodules 12'-14' - slickensided 16'-18' - very stiff to hard 18'-20' - slickensided 23'-25' - w/silt partings 23'-30'	-slickensided 16'-18'		100	95	31 30	70	26	44					
a di mana mana di m	- 20-		-very stiff to hard 18'-20'	***************************************			34	ченория водинальной места подавать водинальной места подавать водинальной места подавать водинальной места под						
							24							
	- 25-				99	101	24	63	24	39				
15.3-	- 30-						26 29						8	_
13.3			NOTE : See Piezometer GB-17P for water level measurements.											

DDC	JECT		LOG OF BORIN Minnetex Place and Almedo Genoa Plac						DDO	150	- NO		1146	2101		
LOC	ATION	:	Minimites Flace and Almeda Genod Plan Paving Improvements WBS No. M-000289-0002-3; Houston N 13793588.40, E 3131246.86 Martin Luther King; See Plan of Boring VATION: 44.60 FT.	Tex	as	2			COM	IPLE ⁻	F NO TION 07-2	DEF	PTH		2.0 F	
+ ELEVATION, FEET O	DEP	SYMBOL	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	O H	AND F NCONF NCONS RIAXIAL DRVAN	TSI PENETI FINED SOLIDA COM	F ROME COMP TED- IPRES	TRENG TER PRESSIGN UNDRA SION	IC Al
	- 5-		Hard dark gray FAT CLAY (CH) -w/calcareous and ferrous nodules and roots 0'-6' -w/ferrous stains 2'-8' -very stiff to hard 4'-6'				15 15								0 0	
36.6			-stiff to very stiff gray and brown slickensided 6'-8' Stiff gray and brown SANDY		89	96	22 28	72	27	45			ļ	0	Δ	
32.6	10-11		LEAN CLAY (CL) w/calcareous and ferrous nodules —gray sand stone 10'—12' Medium stiff to stiff gray				31 15					20				
30.6	15-		and brown FAT CLAY (ĆH) w/sand and ferrous nodules Very stiff reddish brown FAT CLAY (CH) w/silt seams and ferrous stains		78		25 32	61	24	37	0					
	20-		-stiff to very stiff gray and reddish brown slickensided 18'-20'	The state of the s	99	94	33 29	84	30	54			202			_
	25-		-w/calcareous nodules 23'-25' -very stiff to hard 23'-32'				22)		-
	30-		-slickensided 28'-30'				28	A PART OF THE PART) _		_
12.6	35-						28						ф 			_
NO		NDWA	IN BORING: JER ENCOUNTERED DURING DRILLING. 32.0 FT. AT END OF DRILLING. Geotest Engin	a a mi	22.00	In	ο .									

				LOG OF BO	RING N	10.	GB-	-19							
LOC	OJECT : CATION RFACE E	Pavin WBS : N 13	etex Place and g Improvements No. M-000289- 791671.81, E 3 ricksen; See Pla N : 47.69 FT.	-0002-3; Hous 132355.79	ton, Tex	as	ge a	ind		СОМ	PLE"	NO. : FION DE 07-25-	РТН		
-2.2 ELEVATION, FEET	DEPTH, FEET	SAMPLES	DESCRIPTION (0 TO 20.0 FT.	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINE HAND UNCOR TRIAXI TORVA 0.5 1	PENETF NFINED NSOLIDA AL COM	COMPR COMPR TED-UI PRESSI	R ESSION NDRAINE ON
46.4-		Ver C n -s -s -s -s -s -s -s -s -s	" Asphalt Ty stiff dark gr LAY (CH) w/co odules tiff to very sti lickensided 4'- tiff 4'-8' ray 6'-8' ellowish brown 8'-10' r/calcareous ne ferrous stains eddish brown v 10'-20' tiff to very sti slickensided 14	off 2'-4' 6' and gray odules and 8'-14' v/silt seams		94	91	26 27 32 29 26 24 27 33 29 29	78	29	50				
NO	GROUNI	TER IN EDWATER IN TO 20	ENCOUNTERED DUF D.O FT. AT END OF	RING DRILLING. DRILLING. Geotest Eng	ineer	lng,	In	.c.							

	LOG OF BORIN	G NO.	GB-	-20				
PROJECT : LOCATION SURFACE I	Minnetex Place and Almeda Genoa Place Paving Improvements WBS No. M-000289-0002-3; Houston, N 13793183.70, E 3132317.19 Hendricksen; See Plan of Borings (Figu LEVATION: 45.22 FT.	Texas	ge a	ınd	CON	1PLET	NO.: 1140 TION DEPTH D7-26-13	
75.75 ELEVATION, FEET DEPTH, FEET SAMBOL	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: 0.0 TO 23.0 FT. WET ROTARY: 23.0 TO 25.0 FT. DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %		PLASTICITY INDEX, %	UNDRAINED SHE TSI O HAND PENETE UNCONFINED UNCONSOLIDA TRIAXIAL COM A TORVANE 0.5 1.0 1.3	F ROMETER COMPRESSION JED-UNDRAIN PRESSION
- 43.9- - 43.9- - 10- - 15- - 20- - 20- - 30- - 35-	Stiff dark gray FAT CLAY (CH) —w/sand seams 16"—10' —w/ferrous nodules 16"—12' —very stiff 2'—4' —gray 4'—6' —yellowish brown and gray 6'—12' —w/calcareous nodules 8'—14' —w/ferrous stains 8'—16' —very stiff 10'—12' —w/silt seams 10'—25' —stiff to very stiff, slickensided 12'—14' —reddish brown 12'—25' —very stiff 14'—25'	92	98	28	75 28	47		
	TER IN BORING: TJER 1st ENCOUNTERED AT 23.0 FT. DURING DF TO 25.0 FT. AT END OF DRILLING. Geotest Engine				MIN. AT	21.0	FT.	

			LOG OF BORIN	G N	10.	GB-	-21				
	PROJEC _OCATIO SURFAC	۶ ۱ ، ۱۸۲	Minnetex Place and Almeda Genoa Place Paving Improvements WBS No. M—000289—0002—3; Houston, N 13793095.04, E 3130040.12 Leo at Swingle; See Plan of Borings (1 VATION : 47.16 FT.	Tex	as	~	nd		СОМ	PLE.	NO. : 1140195801 FION DEPTH : 25.0 FT 07-26-13
1. 42. ELEVATION, FEET	1	SYMBOL	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH TSF O HAND PENETROMETER UNCONFINED COMPRESSION UNCONSOLIDATED—UNDRAIN TRIAXIAL COMPRESSION A TORVANE 0.5 1.0 1.5 2.0 2.5
- 46. - 39. - 37. - 31. - 29.	.2 - 10 .2 - 15 .2 - 20		4" Asphalt over 5" Sand and Shell Base Very stiff dark gray SANDY LEAN CLAY (CL) w/ferrous nodules and ferrous stains—gray 4'—6'—w/calcareous nodules 4'—8' Very stiff reddish brown FAT CLAY (CH) w/silt seams, calcareous and ferrous nodules Very stiff reddish brown LEAN CLAY (CL)—w/calcareous and ferrous nodules 10'—12' Medium stiff to stiff brown SANDY LEAN CLAY (CL)—w/sand stone 14'—16' Medium dense reddish brown SILTY SAND (SM) w/sand stone Medium stiff to stiff reddish brown SANDY LEAN CLAY (CL) w/sand stone and ferrous stains Very stiff reddish brown FAT CLAY (CH) w/calcareous and ferrous nodules and	31 31 12	99	115	26 24 15 18 24 26 29 21 21 21 21	44	17	27	0.5 1.0 1.5 2.0 2.5
	- 30-		sand pockets								

SYMBOLS AND TERMS USED ON BORING LOGS

SOIL TYPES (SHOWN IN SYMBOL COLUMN) SAMPLER TYPES

(SHOWN IN SAMPLES COLUMN)

















CLAY













Predominant type shown heavy

TERMS DESCRIBING CONSISTENCY OR CONDITION

Basic Soil Type	Density or Consistency	Standard Penetration Resistance, ⁽¹⁾ Blows/ft.	Unconfined Compressive Strength (q _u), ⁽²⁾ Tons/sq. ft.
Cohesionless	Very loose	Less than 4	Not applicable
	Loose	4 to <10	Not applicable
	Medium dense	10 to <30	Not applicable
Ÿ	Dense	30 to <50	Not applicable
·	Very dense	50 or greater	Not applicable
Cohesive	Very soft	Less than 2	Less than 0.25
•	Soft	2 to <4	0.25 to <0.5
	Firm/Medium stiff	4 to <8	0.5 to <1.0
	Stiff	8 to <15	1.0 to <2.0
	Very stiff	15 to <30	2.0 to <4.0
	Hard	30 or greater	4 or greater

- (1) Number of blows from 140-lb. weight falling 30-in. to drive 2-in. OD, 1-3/8-in. ID, split barrel sampler (ASTM D1586)
- (2) qu may also be approximated using a pocket penetrometer

TERMS CHARACTERIZING SOIL STRUCTURE

Parting: -paper thin in size

Seam: -1/8" to 3" thick

Layer: -greater than 3"

Slickensided

- having inclined planes of weakness that are slick and glossy in

appearance.

Fissured

- containing shrinkage cracks, frequently filled with fine sand or silt;

usually more or less vertical.

Laminated Interbedded Calcareous

- composed of thin layers of varying color and texture. - composed of alternate layers of different soil types.

- containing appreciable quantities of calcium carbonate.

Well graded

- having wide range in grain sizes and substantial amounts of all

intermediate particle sizes.

Poorly graded

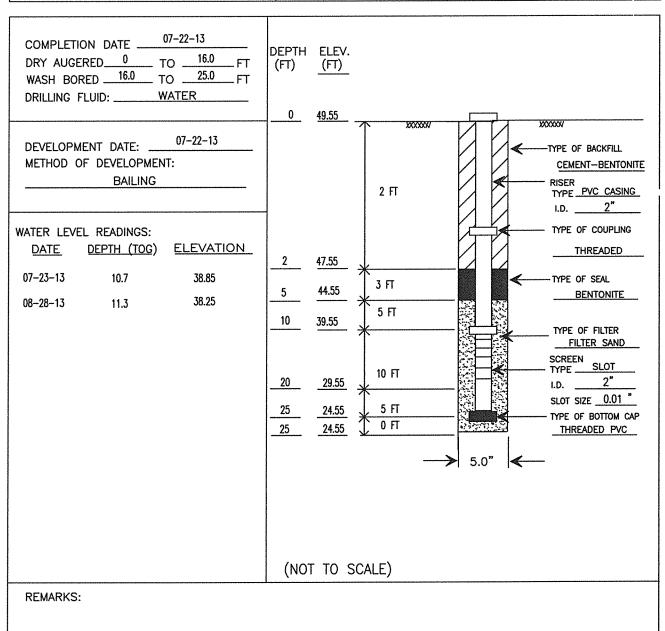
- predominantly of one grain size, or having a range of sizes with some

intermediate size missing.

Flocculated

- pertaining to cohesive soils that exhibit a loose knit or flakey structure.

PROJECT NAME:	MINNETEX AREA AND ALMEDA DRAINAGE IMPROVEMENTS WBS		PIEZOMETER NUMBER: GB-1P
GEOTECHNICAL GEO	CONSULTANT TEST ENGINEERING, INC.	DESIGN CONSULTANT KIT PROFESSIONALS, INC.	HOUSTON, TEXAS



NOTES: 1. DIMENSIONS NOMINAL UNLESS	DRILLED BY:	STARTED: 07-22-13	NORTHING: 13792624.95 EASTING: 3129627.27
OTHERWISE NOTED 2. TOG = TOP OF GROUND	LOGGED BY: TM	COMPLETED: 07-22-13	GROUND LEVEL (MSL): 49.55 FT
	CHECKED BY: NK	APPROVED BY: MB	SHEET <u>1</u> OF <u>1</u>

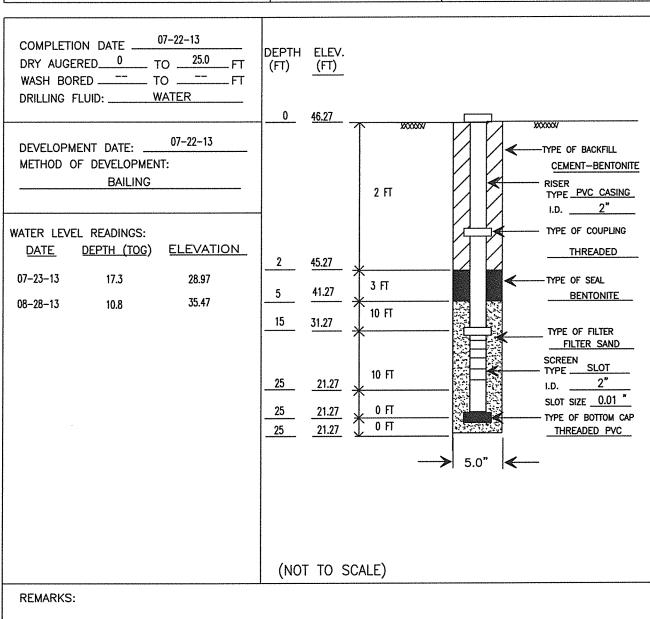
PROJECT NAME: MINNETEX AREA AND ALMEDA GENOA PLACE PAVING AND DRAINAGE IMPROVEMENTS WBS NO. M-000289-0002-3

GEOTECHNICAL CONSULTANT GEOTEST ENGINEERING, INC.

MINNETEX AREA AND ALMEDA GENOA PLACE PAVING AND DRAINAGE IMPROVEMENTS WBS NO. M-000289-0002-3

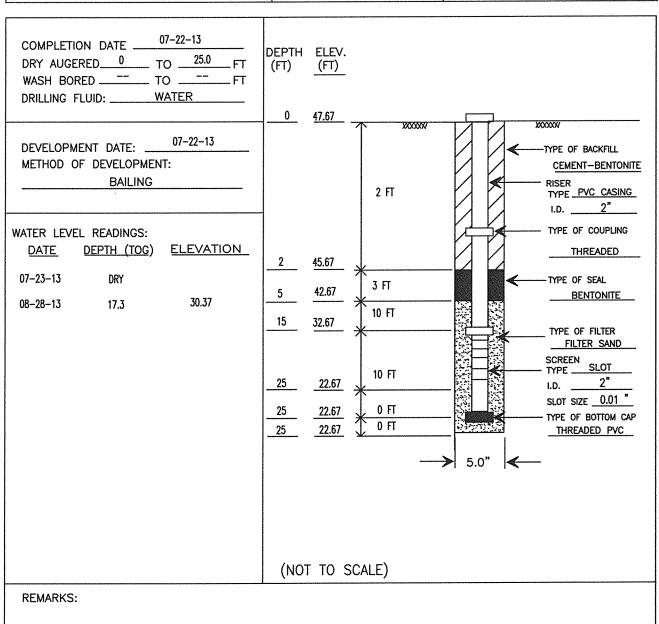
PIEZOMETER NUMBER: GB-10P

HOUSTON, TEXAS



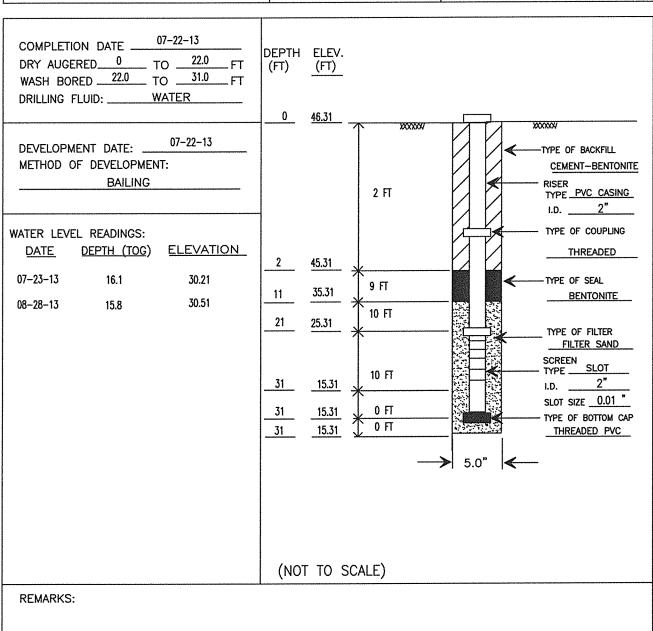
NOTES: 1. DIMENSIONS NOMINAL UNLESS	DRILLED BY: MG	STARTED: 07-22-13	NORTHING: 13792237.08 EASTING: 3132292.75
OTHERWISE NOTED 2. TOG = TOP OF GROUND	LOGGED BY: TM	COMPLETED: 07-22-13	GROUND LEVEL (MSL): 46.27 FT
	CHECKED BY: NK	APPROVED BY: MB	SHEET 1 OF 1

PROJECT NAME:	MINNETEX AREA AND ALMEDA DRAINAGE IMPROVEMENTS WBS		PIEZOMETER NUMBER: GB-12P
GEOTECHNICAL GEO	CONSULTANT DTEST ENGINEERING, INC.	DESIGN CONSULTANT KIT PROFESSIONALS, INC.	HOUSTON, TEXAS



NOTES: 1. DIMENSIONS NOMINAL UNLESS	DRILLED BY: MG	STARTED: 07-22-13	NORTHING: 13791581.62 EASTING: 3130684.67
OTHERWISE NOTED 2. TOG = TOP OF GROUND	LOGGED BY: TM	COMPLETED: 07-22-13	GROUND LEVEL (MSL): 47.67 FT
	CHECKED BY: NK	APPROVED BY: MB	SHEET <u>1</u> OF <u>1</u>

PROJECT NAME:	MINNETEX AREA AND ALMEDA DRAINAGE IMPROVEMENTS WBS		PIEZOMETER NUMBER: GB-17P
GEOTECHNICAL GEO	CONSULTANT OTEST ENGINEERING, INC.	DESIGN CONSULTANT KIT PROFESSIONALS, INC.	HOUSTON, TEXAS



NOTES: 1. DIMENSIONS NOMINAL UNLESS	DRILLED BY: MG	STARTED: 07-22-13	NORTHING: 13793129.43 EASTING: 3131240.99
OTHERWISE NOTED 2. TOG = TOP OF GROUND	LOGGED BY: TM	COMPLETED: 07-22-13	GROUND LEVEL (MSL): 46.31 FT
	CHECKED BY: NK	APPROVED BY: MB	SHEET <u>1</u> OF <u>1</u>

APPENDIX B

	Figure
Summary of Laboratory Test Results	B-1 thru B-2
Grain Size Distribution Curves	B-22

RESULTS PROJECT NAME: Minnetex Place and Almeda Genoa Place Drainage and Paving Improvements WBS No. M—000289—0002—3; Houston, Texas	ATTERBERG COMPRESSION COMPRESSION TORVANE TROMETER TEST (U-U)	WATER DRY NO. 200 Shear Shear Shear Shear	(%) (pcf)	26 0.30 0.25 Fot Clay	23 0.50 Fat Clay	23 103 72 27 45 83 0.61 0.43 0.50 0.25 Fat Clay	18 0.63 1.00 Fat Clay	22 0.75 1.13 Fat Clay	28 1.00 Fat Clay	26 100 81 29 1.29 1.01 0.88 1.25 Fat Clay	27 1.00 Fat Clay	22 Sondy Silt	20 Sondy Silt	30 1.13 Fat Clay						N FIELD SPT = Standard Penetration Test LL = Liquid Limit PL = Plostic Limit PL = Plostic Limit
nd Alr ents :89-00		1				0														
x Place a Improvem 3. M-0002	UNCONFINE COMPRESSI TEST	Shear	Strength (tsf)																	Test
I., W		PASSING NO. 200	SiEVE (%)			83				66		56						***************************************		Penetration mit imit
N N U	RC C	ā	Σ			45				52										andard quid Lir ostic L
OJEC.	TERBE	ä	<u> </u>																	11 11 11
g g	¥	1				7.2				80										유크로
		DRY	(pcf)			103				001										
SULTS		WATER	(%)	26	23	23	13	22	28	26	27	22	20	30						FIELD
SUMMARY OF LABORATORY TEST RESULTS GEOTEST ENGINEERING, INC.		Tay	(blows/ft.)	The second of th								7	80							O. N.
ATOR			Туре	9	9	9	9	9	g	9	9	SS	SS	9						APLE, E PLE
ARY OF LABORATORY TES' CEOTEST ENGINEERING,	SAMPLE	€O	Bottom	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0						RBED SAM OON SAM UTTINGS
IARY OF	SAM	Depth (ft.)	Тор	**0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.5	18.5	23.0						= UNDISTURBED SAMPLE, EXTRUDI = SPLIT SPOON SAMPLE = AUGER CUTINGS - DITCHED BADDET
SUMM			Š.	2	3	4	5	ပ	7	ω	6	10	=	12						SS = =
		SONIACE	NO.	CB-1 (CB-1P)																LEGEND:

-	SUMN	IARY OI	' LABOR	ATOF	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	JECT	PROJECT NAME:	:: Minnete	x Place and	Almedo	y Genoa	Place	Drainage	and
The state of the s	average de la constante de la	CEOTE	CEOTEST ENCINEERING,	SINE	ERING, INC.			PRO	PROJECT	NOM	WBS No BER: 1140	WBS No. M-000289-0002-3; NUMBER: 1140195801	-0005-	.3; Hou	Houston, Texas	as	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	ညွ		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE— TROMETER	
BORING	,	De	Depth (ft.)		SPT	WATER	DRY	3	7	ā	PASSING NO. 200 SIEVE	Shear	Shear	Conf.	Shear	Shear	***************************************
NO.	o N	Тор	Bottom	Туре	(blows/ft.)	(%)	(bct)	}		-	(%)	(tsf)	(tsf)	(tsf)	(tsf)	(tsf)	TYPE OF MATERIAL
CB-2	2	1.0	2.0	9		22	107								0.85	0.63	Fot Clay
	3	2.0	4.0	9		24									1.50	1.00	Fat Clay
	4	4.0	6.0	9		25	100	99	23	43	85		0.94	0.43	1.38	0.75	Fat Clay
	5	6.0	8.0	9		18									1.00	1.13	Fat Clay
	ဖ	8.0	10.0	9		19									1.50	1.50	Fat Clay
	7	10.0	12.0	9		24	102	56	22	34	94		0.94	0.86	1.88	1.50	Fat Clay
	80	12.0	14.0	9		27									0.25	0.50	Fot Clay
	ი	14.5	16.0	SS	æ	24					44						Silty Sand
	5	16.5	18.0	SS	14	27											Fat Clay
	7	18.0	20.0	9		22									2.25	1.50	Fat Clay
	12	23.0	25.0	9		25									1.63	1.38	Fat Clay

		mary manager (Appendicate															
LEGEND:	SS SS W	SPLIT S AUGER (PITCHER Nx-DOU	 UNDISTURBED SAMPLE, EXTRUDI SPLIT SPOON SAMPLE AUGER CUTINGS PITCHER BARREL SAMPLE NX-DOUBBLE BARREL SAMPLE 	MPLE, MPLE SAMPL REL S	<u>z</u> 0:	FIELD		SP 무무도	= Sto = Liqu = Plos	indard Jid Lim stic Lir sticity I	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	fest					
	1									-							

	SUMN	(ARY OI	7 LABOR	ATOF	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	JECT	PROJECT NAME	۱	x Place and	l Almedo	a Genoa	Place	Drainage	and
	**************************************	GEOTE	CEOTEST ENCINEERING,	SINE	ERING, INC.			PRO	PROJECT		WBS No WBS No NUMBER: 1140	WBS No. M-000289-0002-3; R: 1140195801	9-0002-		Houston, Texas	sp	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	သို		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	
BORING		De (Depth (ft.)		SPT	WATER	DRY		4	ā.	PASSING NO. 200 SIEVE	Shear	Shear	Conf.	Shear	Shear	
NO.	No.	Тор	Bottom	Туре	(blows/ft.)	(%)	(bct)	1	J	-	(%)	(tsf)	(tsf)	(tsf)	(tst)	(tsf)	TYPE OF MATERIAL
CB-3	2	1.0	2.0	9		22	103	35	17	8					1.13	1.00	Lean Clay
	3	2.0	4.0	9		26									1.25	0.75	Fat Clay
	4	4.0	6.0	9		21									1.63	1.00	Fat Clay
	5	6.0	8.0	9		21	108	57	23	34	85		1.09	0.58	1.25	1,38	Fat Clay
	9	8.0	10.0	9	1	21									1.88	0.88	Fat Clay
	7	10.0	12.0	9	110	25									1.25	1.50	Fat Clay
	8	12.0	14.0	9		27	CONTRACTOR OF THE SECOND								1.75	1.50	Fat Clay
	6	14.0	16.0	9		29	98	74	27	47	100		0.87	1.15	1.63	1.50	Fat Clay
	5	16.0	18.0	9		24									1.75	1.63	Fot Clay
	-	18.0	20.0	9		29									2.25	1.75	Fat Clay
	12	23.0	25.0	9		22									1.38	1.38	Lean Clay
															A CONTRACTOR OF THE CONTRACTOR		
																The second secon	
LEGEND:	SSS P X B AG X B B B B B B B B B B B B B B B B B B B	SPLIT S AUGER : PITCHER	 UNDISTURBED SAMPLE, EXTRUDE SPLIT SPOON SAMPLE AUGER CUTINGS PITCHER BARREL SAMPLE NX-DOUBBLE BARREL SAMPLE 	MPLE, APLE SAMPL SREL S	<u>≅</u>	FIELD		PPFS	Sto	undard uid Lir nstic Li sticity	Standord Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					
	1												***************************************	-			

			ERIAL					***************************************														
and			TYPE OF MATERIAL	Fat Clay	Fot Clay	Fat Clay	Fat Clay	Fat Clay	Fat Clay	Fat Clay	Fat Clay	Fat Clay	Fat Clay	Fat Clay	A CONTRACTOR OF THE CONTRACTOR				of the propagations is a few propagation of the pro			
nage	POCKET PENE- TROMETER	Shear	Strength (tsf)	0.50	0.63	0.63	0.63	1.25	1.75	1.50	1.88	1.38	1.50	2.13								
Place on, Te	TORVANE	1	strengtn (tsf)	1.00	08.0	1.13	1.25	1.38	1.38	1.50	2.00	1.38	1.25	2.25							The state of the s	
3;	(IAL ESSION (U-U)	Conf.	(tsf)				0.58					1.30					-					
Almeda ts 1-0002-3	TRIAXIAL COMPRESSION TEST (U-U)	Shear	strengtn (tsf)				0.89					1,18									The state of the s	
Minnetex Place and Almeda Paving Improvements WBS No. M-000289-0002 R: 1140195801	UNCONFINED COMPRESSION TEST	Shear																				est
. W		PASSING NO. 200 SIEVE	315VE (%)				83					100										Stondord Penetration Test Liquid Limit Plastic Limit Plasticity Index
	RG	ā	Ε	39			40					45										ondare quid Li ostic osticity
PROJECT	ATTERBERG LIMITS	ā	<u>ن</u>	25			25					27										11 11 11
PR(AT		1	64			65					72										SPT
		DRY	(bct)	104			102					96										
SULTS		WATER	(%)	21	27	25	24	23	34	16	28	30	29	21		-						FIELD
SUMMARY OF LABORATORY TEST RESULTS GEOTEST ENGINEERING, INC.		TdS	(blows/ft.)											***************************************								Z
ATOR INEE			Туре	9	9	9	9	9	9	9	9	9	9	9								PLE, F
ARY OF LABORATORY TES GEOTEST ENGINEERING,	SAMPLE	£(:	Bottom	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0								UNDISTURBED SAMPLE, EXTRUDED SPLIT SPOON SAMPLE AUGER CUTTINGS PITCHER BARREL SAMPLE Nx—DOUBBLE BARREL SAMPLE
(ARY OF CEOTE:	SAM	Depth (ft.)	Тор	1.2	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	23.0								SPLIT SP AUGER C PITCHER Nx-DOUE
SUMM			Š.	2	М	4	5	ဖ	7	∞	6	5	=	12								SS S X X X X X X X X X X X X X X X X X
V 2		BORING	NO.	CB-5A					-													LEGEND:

	SUMM	IARY OF	F LABOR	RATOR	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	JECT	PROJECT NAME:	ı	x Place and	J Almeda	g Genoa	Place	Drainage	and
		CEOTE	CEOTEST ENGINEERING,	SINEE	ERING, INC.			PRO	PROJECT		WBS No NUMBER: 1140	WBS No. M-000289-0002-	9-0002-	5,	Houston, Texas	s D.	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	35		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	
0		De (f	Depth (ft.)			WATER	DRY	-	Č	Ī	PASSING NO. 200	Shear	Shear		Shear	Shear	
BORING NO.	No.	Тор	Bottom	Туре	SPI (blows/ft.)	CONTENT (%)	DENSIIY (pcf)	=	럾	<u>n.</u>	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
CB-6	2	1.0	2.0	g S		17									0.70	0.75	Fat Clay
	ъ	2.0	4.0	gn		24									0.70	0.38	Fat Clay
	4	4.0	6.0	g		21	107	57	23	34	82		0.78	0.43	1.00	0.50	Fat Clay
	5	6.0	8.0	gn		20									1.88	1.38	Fat Clay
	ω	8.0	10.0	g		21									1.25	1.50	Fat Clay
	7	10.0	12.0	g,		24									1.25	1.50	Fat Clay
	80	12.0	14.0	αn		27									2.13	1.75	Fat Clay
	б	14.0	16.0	g		22	101	59	23	36	86		1.15	1.15	1.88	1.13	Fat Clay
	10	16.0	18.0	an		19									1.25	1.38	Fat Clay
	=	18.0	20.0	Qn		22									1.13	1.25	Fat Clay
111111111111111111111111111111111111111	12	22.0	23.0	AG		22											Sandy Lean Clay
	13	23.5	25.0	SS	18	20					32						Silty Sand
		The state of the s															
											o prome significant management and control						
The state of the s																	
LEGEND:	SS AC NX BB	SPLIT S SPLIT S AUGER (PITCHER Nx-DOU	= UNDISTURBED SAMPLE, EXTRUDI SPLIT SPOON SAMPLE A AUGER CUTINGS PITCHER BARREL SAMPLE NX—DOUBBLE BARREL SAMPLE	MPLE, APLE SAMPL SEL SA	ED	FIELD		SPT PPL PP	Sto	andard uid Lir istic Lir sticity	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					
The state of the s	ı						-	-	-								

S	UMM	ARY OF	LABOF	RATOR		SULTS		PRC	PROJECT	i	E: Minnete Paving WBS No	NAME: Minnetex Place and Almeda Genoa Pla- Paving Improvements WBS No. M-000289-0002-3: Houston	A Almedonts	Genod	9 4	inage	and
-		CEOTEST		SINE	ENGINEERING, INC.			PRC	PROJECT	- 1	IBER: 1140	195801			4100	<u>, </u>	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	RG		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	
L		Depth (ft.)	oth t.)			WATER	DRY		i	i	PASSING NO. 200	Shear	Sheor	Conf.	Shear	Shear	
BORING NO.	No.	Тор	Bottom	Туре	SPI (blows/ft.)	CONTENT (%)	DENSITY (pcf)	=	<u>ದ</u>	ā.	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
	7	1.0	2.0	gn .		15	113	47	17	30					2.25	2.25	Lean Clay
	ы	2.0	4.0	9n		16									2.25	2.13	Lean Clay
	4	4.0	6.0	25		20									1.63	1.75	Fat Clay
	5	6.0	8.0	gn .		20	111	53	22	31	84		1.06	0.58	1.25	0.75	Fat Clay
	9	8.0	10.0	9		19									1.25	1.38	Fat Clay
	7	10.0	12.0	an		29									1.38	1.13	Fat Clay
	8	12.0	14.0	an		26									1.63	1.38	Fat Clay
-	6	14.0	16.0	g		22									2.25	1.25	Fat Clay
	5	16.0	18.0	an		25	104	99	25	14	98		1.16	1.30	1.63	1.50	Fat Clay
		18.0	20.0	an		26									1.75	1.25	Fat Clay
	12	23.0	25.0	an		28									1.38	1.25	Fat Clay
~ v) < 11 Z	SS AG		JRBED SAL POON SAN CUTTINGS BARREL BBLE BAR	MPLE, APLE SAMPLI	UNDISTURBED SAMPLE, EXTRUDED IN F SPLIT SPOON SAMPLE AUGER CUTINGS PITCHER BARREL SAMPLE Nx—DOUBBLE BARREL SAMPLE	FIELD		SPLS	Sto	andard Juid Lir Jatic Li Sticity	Standord Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					

0,2	SUMM	IARY OF	F LABOF	RATOR	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT	NAME:		x Place and	l Almeda ts	3 Genoa	Place	Drainage	and
	appendix and a second and a	GEOTEST		CINE	ENGINEERING, INC.			PRO,	PROJECT	WE NUMBER:	WBS No	WBS No. M-000289-0002-	-0005-	33	Houston, Texas	SD	
		SAN	SAMPLE					ATTA L	ATTERBERG LIMITS	ပ္		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE – TROMETER	
BORING		De (Depth (ft.)			WATER	DRY	=	ā	ā	PASSING NO. 200 SIEVE	Shear	Shear	Conf.	Shear	Shear	
NO.	Š.	Тор	Bottom	Туре	(blows/ft.)	(%)	(pcf)	1			3EVE (%)	strengtn (tsf)	strengtn (tsf)	(tsf)	strengtn (tsf)	strength (tsf)	TYPE OF MATERIAL
GB-8	2	0.0	2.0	an		13									1.38		Sandy Lean Clay
	3	2.0	4.0	9		18									2.00	2.25	Fat Clay
	4	4.0	6.0	an		16	112	61	24	37	83		2.66	0.43	2.00	1.75	Fat Clay
	လ	6.0	8.0	9		16									2.00	2.25	Fat Clay
	9	8.0	10.0	9		17									2.00	2.25	Fat Clay
	7	10.0	12.0	gn		26									2.00	1.88	Fat Clay
	ω	12.0	14.0	g		26									1.50	1.50	Fat Clay
	თ	14.0	16.0	gn		29									1.50	1.38	Fat Clay
	9	16.0	18.0	an		26	66	8	26	44	66		1.11	1.30	1.38	1.25	Fat Clay
	=	18.0	20.0	Qn		28									1.38	1.38	Fat Clay
	13	24.0	25.0	g		25						To the water of the control of the c			1.25	1.13	Fat Clay
											:						
LEGEND:	SSS X X X B B B B B B B B B B B B B B B B B	SPLIT SI AUGER (PITCHER Nx-DOU	= UNDISTURBED SAMPLE, EXTRUDI SPLIT SPOON SAMPLE A AUGER CUTTINGS PITCHER BARREL SAMPLE • NX—DOUBBLE BARREL SAMPLE	MPLE, APLE SAMPL SPEL S	S S	FIELD		R 무 교	= Star = Liqu = Plas	ndard F iid Limil stic Lim ticity In	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	Fest					
	1						T						Water and the state of the stat	-			

J	SUMM	ARY OF	LABOR	ATOR	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT	NAME:	1	x Place and	Almed	3 Genoc	Genoa Place Drainage		and
		CEOTE	GEOTEST ENCINEERING,	:INEF	FRING, INC.			PRO	PROJECT		raving WBS No NUMBER: 1140	raving improvements WBS No. M-000289-0002-3; Houston, R: 1140195801	rs 9-0002-	-3; Hou	ston, Texas	SD	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	22		UNCONFINED COMPRESSION TEST	1	TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE - TROMETER	
G		Depth (ft.)	pth t.)			WATER	DRY			i	PASSING NO. 200	Shear	Shear	Conf.	1	Shear	
BORING NO.	No.	Тор	Bottom	Туре	(blows/ft.)	CONIENI (%)	DENSIIY (pcf)	∃	<u> </u>	<u>.</u>	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
CB-9	3	1.5	2.0	g		26									1.00	0.88	Fat Clay
	4	2.0	4.0	S		30	94	69	26	43					0.80	0.38	Fat Clay
	5	4.0	6.0	S		29									1.00	0.50	Fat Clay
	9	6.0	8.0	9		32	92	69	26	43	91		0.41	0.58	1.00	0.38	Fat Clay
	7	8.0	10.0	an		27									1.25	1.00	Fat Clay
	ω	10.0	12.0	an		25									1.75	1.25	Fat Clay
	თ	12.0	14.0	gn		28									1.00	1.13	Fat Clay
	10	14.0	16.0	g		30									1.13	1.38	Fat Clay
	=	16.0	18.0	g		22	108	36	17	19	93		0.44	1.30	0.55	0.38	Lean Clay
	12	18.0	20.0	9		30									1.13	1.38	Fat Clay
7.	13	23.5	25.0	SS		27											Fat Clay

												APPLICATION OF THE PARTY OF THE	-				
LEGEND:	SSS AS	SPLIT SI SPLIT SI AUGER (PITCHER	= UNDISTURBED SAMPLE, EXTRUDI SPLIT SPOON SAMPLE AUGER CUTTINGS PITCHER BARREL SAMPLE FOR THE SAMPLE	MPLE, IPLE SAMPLI	S S	FIELD		STT	Sto Liqu	indard uid Lin stic Lii	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					
-	3	221 x	מסרני סייי	אבר ה	AMPLE					***************************************							

SUMMARY OF LABORATORY TEST RESULTS CEOTEST ENCINEERING, INC. PROJECT NAME: Minnetex Place and Almeda Genoa Place Drainage and Manage and Mana	SAMPLE SA	Depth (ft.) WATER DRY LL PL PI SIEVE Strength Strength Strength Strength Strength	Top Bottom Type (blows/ft.) (%) (pcf) (pcf) (tsf) (tsf) (tsf) (tsf)	1.3 2.0 UD 16 114 39 16 23 1.00 Lean Clay	2.0 4.0 UD 20 1.13 Lean Clay	4.0 6.0 UD 15 Lean Clay	6.0 8.0 UD 20 110 52 21 31 78 0.92 0.58 1.50 0.50 Fat Clay	8.0 10.0 UD 22 Sandy Lean Clay	10.0 12.0 UD 25 Sondy Lean Clay	12.0 14.0 UD 24 1.63 1.38 Fat Clay	14.0 16.0 UD 26 100 63 24 39 100 1.15 1.15 1.88 1.50 Fat Clay	16.0 18.0 UD 23 Fat Clay	18.0 20.0 UD 29 Fat Clay							UNDISTURBED SAMPLE, EXTRUDED IN FIELD	UNDISTURBED SAMPLE, EXTRUDED IN FIELD SPLIT SPOON SAMPLE AUGER CUTTINGS	UNDISTURBED SAMPLE, EXTRUDED IN SPLIT SPOON SAMPLE AUGER CUTTINGS AMPLE SAMPLE NX-DOUBBLE BARREL SAMPLE
10m tom tom tom tom tom tom tom tom tom to	2.0 UD 6.0 UD 8.0 UD 12.0 UD 12.0 UD 14.0 UD 14.0 UD 15.0 UD 15.0 UD 15.0 UD 15.0 UD 15.0 UD 15.0 UD										_		-							8	8	
SAMF NG No. Top	Dept (ft. Top 1.3	No. 10p	2 1.3	٠,	2:0						-				7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7					" "	SS B B	SS P S S S S S S S S S S S S S S S S S

	SUMM	IARY OF	7 LABOR	RATOR	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT		: Minnete;	x Place and	Almedo	a Geno	Se	Drainage	and
		CEOTE	CEOTEST ENGINEERING,	SINEE	RING, INC.			PRO	PROJECT		WBS No 3ER: 1140	WBS No. M-000289-0002-3; Houston, NUMBER: 1140195801		-3; Hou	ıston, Texas	g	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	ာ့		UNCONFINED COMPRESSION TEST	ĺ	TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	
CNIGOG		De (Depth (ft.)		~~~~	WATER	DRY	:	i	i	PASSING NO. 200	Shear	Shear		Shear	Shear	
NO.	No.	Тор	Bottom	Туре	(blows/ft.)	(%) (%)	DENSILY (pcf)	d	<u> </u>	<u> </u>	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
GB-12 (GB-12P)	2	1.0	2.0	an		19									1.63	1.63	Sandy Lean Clay
	3	2.0	4.0	g		19									1.13	1.38	Sandy Lean Clay
	4	4.0	6.0	g		16	116	40	16	24	68		1.04	0.43	1.63	1.75	Sandy Lean Clay
	5	6.0	8.0	an		21									1.38	1.13	Sandy Lean Clay
	9	8.0	10.0	g,		23									1.13	1.25	Fat Clay
	7	10.0	12.0	g		25									1.25	2.25	Fat Clay
	80	12.0	14.0	an		24									2.25	1.75	Fat Clay
	6	14.0	16.0	S		29	95	78	28	50	100		1.07	1.15	1.63	1.50	Fat Clay
	5	16.0	18.0	an		30									2.13	1.38	Fat Clay
	=	18.0	20.0	gn		31									1.88	1.25	Fat Clay
	12	23.0	25.0	Gn		31									1.63	1.25	Fat Clay
																	POTRETE PARTY OF PROCESSION OF

LEGEND:	SS = = N		JRBED SAN POON SAN CUTTINGS BARREL BARREL	MPLE, I	UNDISTURBED SAMPLE, EXTRUDED IN F SPLIT SPOON SAMPLE AUGER CUTTINGS TICHER BARREL SAMPLE	FIELD		R 무 교	Star Ligar	ndard I uid Lim stic Lin rticity Ir	Standard Penetration Test Liquid Limit Plostic Limit Plosticity Index	Fest					
			DULE UNI	ואבר ה	MP LE									***************************************			

	SUMA	1ARY OF	F LABOF	RATOF	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRC	JECT	PROJECT NAME:		x Place and Improvemen	Almeda	a Genoa	Place	Drainage	and
	and the second s	CEOTE	CEOTEST ENGINEERING,	CINE	ERING, INC.			PRC	PROJECT		WBS No NUMBER: 1140	WBS No. M-000289-0002-3; R: 1140195801	-0005-	-3; Hou	Houston, Texas	SD)	
		SAN	SAMPLE					TEA J	ATTERBERG LIMITS	RG	Andrea de la constantina della	UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE - TROMETER	
CNAC		De (†	Depth (ft.)			WATER	DRY		i	ō	PASSING NO. 200		Shear		Shear	Shear	
NO.	Š.	Тор	Bottom	Туре	(blows/ft.)	CONIENI (%)	(pcf)	=	<u> </u>	ī	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
GB-13	2	9.0	2.0	S		24									1.50	0.88	Lean Clay
	3	2.0	4.0	9		27									1.13	1.00	Fat Clay
	4	4.0	6.0	9		26	6	99	25	41	87		0.78	0.43	1.00	0.75	Fat Clay
	3	6.0	8.0	9		25									1.25	0.88	Fat Clay
	9	8.0	10.0	B		26									1.13	0.75	Fat Clay
	7	10.0	12.0	9		27									1.00	1.00	Fat Clay
	80	12.0	14.0	9	200000000000000000000000000000000000000	29									1.00	1.13	Fat Clay
	6	14.0	16.0	9		35	88	82	29	53	100		0.34	1.15	0.65	0.75	Fat Clay
	10	16.0	18.0	9		31									1.38	1.13	Fat Clay
	=	18.0	20.0	9		30									1.50	1.13	Fat Clay
	12	23.0	25.0	9		27									1,13	1.25	Lean Clay
																	And the state of t
LEGEND:	SSS AX XX BBG XX NX BBG XX		JRBED SAI POON SAI CUTTINGS BARREL RBIF BAR	MPLE, APLE SAMPL	UNDISTURBED SAMPLE, EXTRUDED IN F SPLIT SPOON SAMPLE AUGER CUTINGS PITCHER BARREL SAMPLE Nx-DOUBBLE BARREL SAMPLE	FIELD		SPLES	= Sto	andard luid Lir astic Li sticity	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					

~ *	SUMM	IARY OI	F LABOF	RATOF	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT	NAME:		x Place and	l Almeda	a Genoa	Place	Drainage	and
T - B - To a recompany and the latest and the lates		CEOTE	CEOTEST ENGINEERINC,	CINE	ERING, INC.			PRO	PROJECT		WBS No NUMBER: 1140	WBS No. M-000289-0002-	-0005-	-3; Houston,	ıston, Texas	s D)	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	ည		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	
0		De (†	Depth (ft.)			WATER	DRY	:	i	i	PASSING NO. 200	Shear	0)	Conf.		Shear	
BORING NO.	Š.	Тор	Bottom	Туре	SPI (blows/ft.)	CONTENT (%)	DENSITY (pcf)	=	ದ	ō	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
GB-14	2	1.2	2.0	9		20									1.25	1.38	Fat Clay
	3	2.0	4.0	G)		23									1.25	0.63	Fat Clay
	4	4.0	6.0	an		17	111	51	21	33	75		1.16	0.43	1.63	1.13	Fat Clay
	'n	6.0	8.0	On		16									2.25	1.63	Fat Clay
	ဖ	8.0	10.0	g		23									1.63	0.63	Fat Clay
	7	10.0	12.0	9		25					TO THE STATE OF TH				1.25	1.13	Fat Clay
	∞	12.0	14.0	9		31									1.25	1.38	Fat Clay
	б	14.0	16.0	an		31	93	77	28	49	100		0.91	1.15	1.63	1.13	Fat Clay
	10	16.0	18.0	On		28									1.63	1.25	Fat Clay
	Ξ	18.0	20.0	9		29									2.25	1.13	Fat Clay
	12	23.0	25.0	9		22		99	24	36	98				2.25	2.25	Fat Clay
	13	28.0	30.0	9		27									0:20	0.25	Lean Clay
AND THE PROPERTY OF THE PROPER																	
LEGEND:	SS = = = N		JRBED SAI POON SAA CUTTINGS BARREL	MPLE, MPLE SAMPL	UNDISTURBED SAMPLE, EXTRUDED IN F SPLIT SPOON SAMPLE AUGER CUTTINGS BITCHER BARREL SAMPLE	FIELD		A 무 무 교	Star Liqu Plas	ndord Jid Lim stic Lir ticity 1	Standord Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					
			מפורב סאח	אבר א	AMPLE												

J2	SUMM	IARY OF	F LABOR	RATOR	SUMMARY OF LABORATORY TEST RESULTS	ULTS		PRO	JECT	PROJECT NAME:		x Place and	Almeda	a Genoa	Place	Drainage	and
		CEOTE	CEOTEST ENCINEERING,	SINEE	RING, INC.		-	PRO	PROJECT	NUMBER:	WBS No BER: 1140	WBS No. M-000289-0002 R: 1140195801	-0005-	3;	Houston, Texas	g	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	- S		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	
OBINC) OG	Depth (ft.)			WATER	DRY	1	ā	i	PASSING NO. 200		Shear	Conf.	1	Shear	
NO.	Š.	Тор	Bottom	Туре	(blows/ft.)	CONIEN (%)	(pcf)	크	로	<u> </u>	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
GB-15	4	1.5	2.5	an		17											
	2	2.5	4.0	gn		23						The state of the s			0.70	0.75	1111
	9	4.0	6.0	g		31									0.25	0.25	
	7	6.0	8.0	9		26	96	61	24	37	75		0.39	0.58	0.50	0.38	Fil
	80	8.0	10.0	9		28									0.25	0.25	
	6	10.0	12.0	g		35									0.25	0.25	Ē
	5	12.0	14.0	9		32									0.25	0.25	Fill
	=	14.0	16.0	gn		27									0.25	0.25	FIII
	12	16.0	18.0	S		33									0.45	0.50	III
	13	18.0	20.0	ΑG		20	_										II.
	14	20.0	22.0	9	And the second s	21	107	45	22	23	98		1.31	1.58		1.38	Lean Clay
	15	23.0	25.0	9		30									0.65	1.13	Fat Clay
	16	28.0	30.0	9		27									1.50	1.88	Fat Clay
											ACES MITTERS OF A SERVICE MINISTERS OF A SERV						
												and the state of t					

					THE RESERVE OF THE PERSON OF T												The state of the s
LEGEND:	SSS AG		POON SAN CUTTINGS BARREL	MPLE, I	UNDISTURBED SAMPLE, EXTRUDED IN F SPLIT SPOON SAMPLE AUGER CUTTINGS PITCHER BARREL SAMPLE	FIELD		P 모 모 모	= Star = Liqu = Plas	indard Jid Lim Stic Lir sticity Is	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					
			BBLE BAK	KEL V	AMPLE							THE STATE OF THE S					

SUMMARY OF LABORATORY TEST RESULTS CEOTEST ENGINEERING, INC. PROJECT NUMBER: 1140195801	SAMPLE SAMPLE COMPRESSION TORVANE PENEL TEST (U-U) TRIAXIAL TEST TEST TEST TRIAXIAL TRIAXIAL TRIAXIAL TORVANE PENEL TROMETER	(ft.) SPT CONTENT DRY II DI DI CICAT Shear Shear Conf. Shear	(pcf) (2) (15) (15) (15) (15)	1.2 2.0 UD 25 60.50 Fot Cloy	2.0 4.0 UD 29 93 69 26 43 1.00 0.63 Fat Clay	4.0 6.0 UD 30 1.13 0.75 Fot Clay	6.0 8.0 UD 29 96 75 28 47 93 0.71 0.58 1.13 0.75 Fat Clay	8.0 10.0 UD 29 1.13 0.75 Fat Clay	10.0 12.0 UD 31 0.85 0.88 Fot Clay	12.0 14.0 UD 28 1.50 Fat Clay	14.0 16.0 UD 23 1.50 Fat Clay	16.0 18.0 UD 30 1.25 Fot Clay	18.0 20.0 UD 26 Fot Clay	23.0 25.0 UD 24 104 64 25 39 97 0.75 1.80 1.75 1.88 Fat Clay	28.0 30.0 UD 25 1.13 Fot Clay	30.0 31.0 UD 27 Fat Clay					= UNDISTURBED SAMPLE, EXTRUDED IN FIELD Standard Penetration Test SPLIT SPOON SAMPLE Liquid Limit
ABORA'	Ш		-+																		ED SAMPI
Y OF L	SAMPL	Depth (ft.)		1.2	2.0	4.0	6.0														DISTURBE JT SPOO
MMARY GE			No. To	2 1	3 2	4	5 6	8 9	7 10	8 12	9 14	10 16	11 18	12 23	13 28						11 11
ns			NO.	CB-16								-	-	-	-	14					LEGEND: UD SS

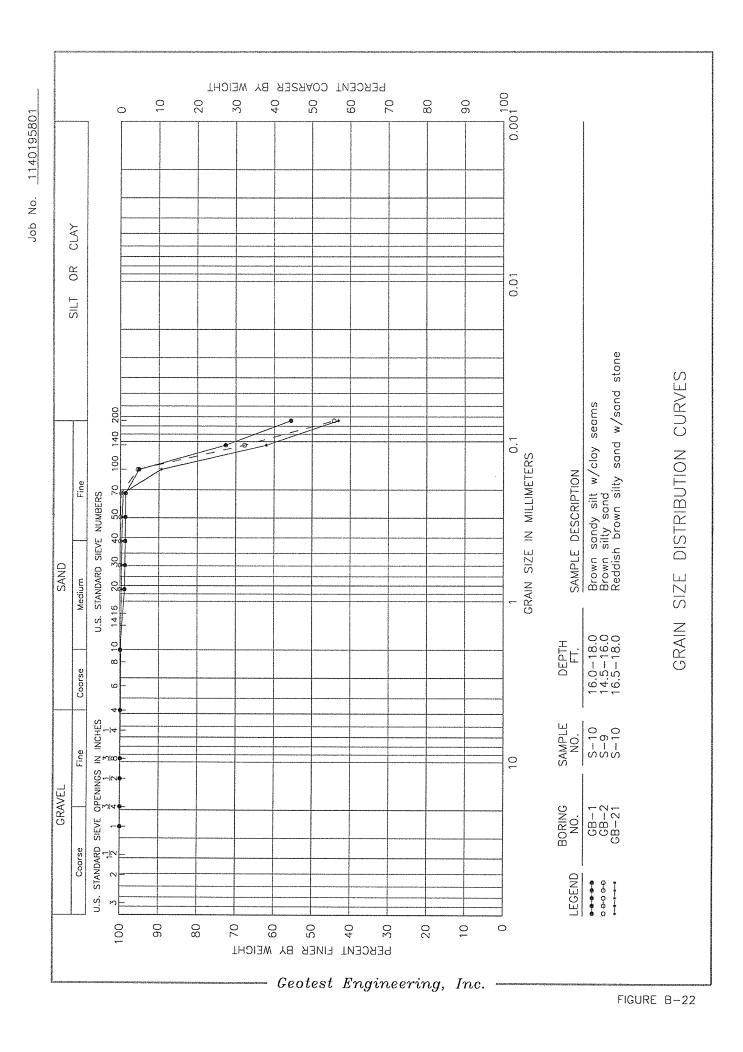
	SUMA	AARY OI	F LABOF	RATOR	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT	NAME:		x Place and	Almeda	3 Genoa	Place	Drainage	and
		CEOTE	CEOTEST ENGINEERING,	SINEE	ERING, INC.			PRO	PROJECT	W WUMBER:	WBS No BER: 1140	WBS No. M-000289-0002 R: 1140195801	-0005-	3,	Houston, Texas	s D	
		SAN	SAMPLE					TTA I	ATTERBERG LIMITS	ည္က		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	A Company of the Comp
Q		De (†	Depth (ft.)			WATER	DRY		i	i	PASSING NO. 200	Shear	"	Conf.		Shear	-
NO.	Š.	Тор	Bottom	Туре	(blows/ft.)	CONIENI (%)	DENSIIY (pcf)	∃	<u>ت</u>	<u> </u>	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
C8-17 (C8-17P)	М	2.0	4.0	an		21									1.38	0.75	Fat Clay
	4	4.0	6.0	g		22	104	55	22	33	86		0.93	0.43	1.50	0.75	Fat Clay
	ი	6.0	8.0	an		24									1.38	0.75	Fat Clay
	9	8.0	10.0	S		27									1.38	0.75	Lean Clay
	7	10.0	12.0	9		21		36	19	17	82				08.0	0.63	Lean Clay
	80	12.0	14.0	9		27									1.63	1.88	Fat Clay
	6	14.0	16.0	9		31									1.38	1.38	Fat Clay
	10	16.0	18.0	S		30	95	8	26	44	100		1.51	1.30	1.88	1.13	Fat Clay
	11	18.0	20.0	g		34									2.00	1.13	Fat Clay
	12	22.0	23.0	AG		24											Fat Clay
	13	23.0	25.0	gn		24	101	63	24	39	99		1.00	1.80	1.88	1.25	Fat Clay
	14	28.0	30.0	gn		26									1.88	1.88	Fat Clay
	15	29.0	31.0	9		26									1.88	1.88	Fat Clay
LEGEND:	SS AG SS II	SPLIT S. AUGER (= UNDISTURBED SAMPLE, EXTRUDI = SPLIT SPOON SAMPLE = AUGER CUTINGS = PITCHER BARREL SAMPLE = Nx—DOJIBRI F RARREL SAMPLE	MPLE, MPLE	S. S.	FIELD		유기국의	Stor	ndard Jid Lim Stic Lin	= Standard Penetration Test = Liquid Limit = Plastic Limit : Plasticity Index	est					
	1	33	מסרר כיי	N. L.	- AMIL C.L.					-						***************************************	

	SUMM	IARY OI	T LABOR	RATOF	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT	NAME:	1	x Place and	Almedo	3 Geno	e	Drainage	and
		CEOTE	CEOTEST ENCINEERING,	CINE	ERING, INC.			PRO	PROJECT		WBS No WBS No NUMBER: 1140	ruving improvements WBS No. M-000289-0002-3; Houston, R: 1140195801	18 1-0002-	-3; Hou	ston, Texas	gs	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	22		UNCONFINED COMPRESSION TEST	TRIA COMPR TEST	TRIAXIAL COMPRESSION TEST (U-U)	ANE	POCKET PENE - TROMETER	
Q Q		De (1	Depth (ft.)		*****************	WATER	DRY				PASSING NO. 200	Shear	Shear		Shear	Shear	
NO.	No.	Тор	Bottom	Туре	(blows/ft.)	CONTENT (%)	DENSITY (pcf)	=	<u>.</u>	<u>a</u>	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
GB-18	-	0.0	2.0	9		15									2.25	2.25	Fat Cloy
	2	2.0	4.0	9		15									2.25	2.25	Fat Clay
	3	4.0	6.0	9		22									2.25	1.63	Fat Clay
	4	6.0	8.0	9		28	96	72	27	45	89		0.81	0.58	1.00	0.63	Fat Clay
	2	8.0	10.0	9		31									0.55	0.75	Sandy Lean Clay
	9	10.0	12.0	AG		15											Sandy Lean Clay
	7	12.0	14.0	9		25		61	24	37	78				1.13	0.38	Fat Clay
	ω	14.0	16.0	9		32									1.25	1.00	Fat Clay
	6	16.0	18.0	9		33									1.25	1.13	Fat Clay
	0	18.0	20.0	9		29	94	84	30	54	66		0.93	1.44	1.25	0.88	Fat Clay
	=	23.0	25.0	9		22									2.25	1.50	Fat Clay
	12	28.0	30.0	9		28									1.88	1.50	Fat Clay
	13	30.0	32.0	9	1	28									2.25	1.50	Fat Clay
					100 mm												
LEGEND:	SSS AS		JRBED SAI POON SAN CUTTINGS BARREL	MPLE, MPLE SAMPL	UNDISTURBED SAMPLE, EXTRUDED IN F SPLIT SPOON SAMPLE AUGER CUTTINGS PITCHER BARREL SAMPLE NUMBER BARREL SAMPLE	FIELD		S 무무도	= Sto = Liqu = Plos	andard uid Lim Istic Lir sticity	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					
			IDDLE DAR	מאבר ט	AMPLE												

	SUMM	ARY OF	T. LABOE	ATOR	SIIMMARY OF LABORATORY TEST RESILLTS	STILE		PRO	PROJECT	1	E: Minnete:	x Place and	Almedo	Geno	Ge	Drainage	and
		CEOTE	CEOTEST ENCINEERING,	SINE	ERING, INC.			PRO	PROJECT		Paving WBS No BER: 1140	Paving Improvements WBS No. M-000289-0002-3; Houston, NUMBER: 1140195801	ts 0002-	-3; Hou	<u>⊕</u>	SD	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	35		UNCONFINED COMPRESSION TEST	1	TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE – TROMETER	
g		Dei (†	Depth (ft.)			WATER	DRY	i	i		PASSING NO. 200		Shear	Conf.		Shear	
NO.	No.	Тор	Bottom	Туре	(blows/ft.)	(%)	(pcf)]	<u>.</u>	<u> </u>	SiEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
CB-19	2	1.3	2.0	S		26									1.25	1.13	Fat Clay
	3	2.0	4.0	9		27									1.00	0.88	Fat Clay
	4	4.0	6.0	an		32	88	80	29	51	94		0.84	0.43	06.0	0.75	Fat Clay
	S	6.0	8.0	g		29									0.75	0.75	Fot Clay
	9	8.0	10.0	g		26									1.25	1.00	Fat Clay
	7	10.0	12.0	gn		24									1.25	1.25	Fat Clay
	8	12.0	14.0	g		27									1.50	1.38	Fat Clay
	6	14.0	16.0	gn		33	91	78	28	50	100		0.85	1.15	1.25	1.13	Fat Clay
	10	16.0	18.0	g _n		29									1.38	1.25	Fot Clay
	=	18.0	20.0	an		29									1.50	1.25	Fot Clay
																	A CONTRACTOR OF THE PROPERTY O
				_													
LEGEND:	SS AG = =		JRBED SAI POON SAIV SUTTINGS BARREL	MPLE, APLE SAMPLE	UNDISTURBED SAMPLE, EXTRUDED IN F SPLIT SPOON SAMPLE AUGER CUTTINGS PITCHER BARREL SAMPLE	FIELD		RPLS	Storing Storin	indard Jid Lim stic Lin sticity li	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	lest					
			BBLE BAK	ZEL V	AMPLE												W. C.

	SUMN	IARY OF	- LABOR	ATOR	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT	NAME:	1	x Place and	Almeda	a Genoa	Place	Drainage	and
	november and a southern the sou	CEOTEST	ST EN	HINEE	ENGINEERING, INC.			PRO	PROJECT	NUMBER:	WBS No BER: 1140	MBS No. M-000289-0002. R: 1140195801	9-0002-	3;	Houston, Texas	SD	
		SAN	SAMPLE					ATT	ATTERBERG LIMITS	ر رو		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE – TROMETER	
CNIGOR		De	Depth (ft.)			WATER	DRY	:	ā	i	PASSING NO. 200	Shear	Shear	Conf.		Shear	
NO.	No.	Тор	Bottom	Туре	(blows/ft.)	CONTENT (%)	(pcf)	-1	<u>ਜ</u>	<u> </u>	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
GB-20	2	1.3	2.0	an		26									0.75	0.50	Fat Clay
	3	2.0	4.0	9		25	98	65	25	40					1.25	1.13	Fat Clay
	4	4.0	0.9	S		28									0.75	0.75	Fat Clay
	5	0.9	8.0	9		29	94	75	28	47	92		0.70	0.58	0.65	0:50	Fat Clay
	9	8.0	10.0	9		27									0.85	0.88	Fat Clay
	7	10.0	12.0	g		28									1.00	1.00	Fat Clay
	80	12.0	14.0	g		27	96						0.93	1.01	1.25	0.88	Fat Clay
	6	14.0	16.0	g		27									1.38	1.38	Fat Clay
	10	16.0	18.0	g		29									1.38	1.38	Fat Clay
	-	18.0	20.0	g		21									1.38	1.25	Fat Clay
	12	23.0	25.0	9	THE RESERVE AND ADDRESS OF THE PARTY OF THE	23						30			1.50	1.50	Fat Clay
																	The state of the s
																	70-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37-31-37
					The state of the s		The state of the s										
LEGEND:	SSS SX XX BAG N H H H H	SPLIT S AUGER (PITCHER Nx-DOU	 UNDISTURBED SAMPLE, EXTRUDI SPLIT SPOON SAMPLE AUGER CUTINGS PITCHER BARREL SAMPLE NX-DOUBBLE BARREL SAMPLE 	MPLE, IPLE SAMPLI REL SA	EXTRUDED IN FIELD E. F.	эего		유민	Sto	indard Jid Lim stic Lir sticity I	Standord Penetration Test Liquid Limit Plastic Limit Plasticity Index	Fest					
	1									-							

	SUMN	ARY OF	F LABOF	RATOF	SUMMARY OF LABORATORY TEST RESULTS	SULTS		PRO	PROJECT	l .	IE: Minneter	x Place and	Almeda	a Genoa	Place	Drainage	and
		CEOTE	CEOTEST ENGINEERING,	CINE	ERING, INC.			PRO	PROJECT		WBS No IBER: 1140	WBS No. M-000289-0002.	9-0002-	3;	Houston, Texas	s D)	
	:	SAN	SAMPLE					ATT	ATTERBERG LIMITS	RG		UNCONFINED COMPRESSION TEST		TRIAXIAL COMPRESSION TEST (U-U)	TORVANE	POCKET PENE- TROMETER	
CINICO		De	Depth (ft.)			WATER	DRY		Į ā	ō	PASSING NO. 200	Shear	Shear	Conf.	Shear	Shear	
NO.	No.	Тор	Bottom	Туре	(blows/ft.)	CONIENI (%)	(pcf)	=	<u> </u>	ב	SIEVE (%)	Strength (tsf)	Strength (tsf)	Press. (tsf)	Strength (tsf)	Strength (tsf)	TYPE OF MATERIAL
CB-21	2	0.8	2.0	9		26									1.50	1.00	Sandy Lean Clay
***************************************	3	2.0	4.0	S		24									1.25	1.13	Sandy Lean Clay
	4	4.0	6.0	9		15	115	44	17	27	59		1.04	0.43	1.50	1.50	Sandy Lean Clay
	S	6.0	8.0	gn		81									1.88	1.50	Sandy Lean Clay
	9	8.0	10.0	gn		24									1.38	1.38	Fat Clay
	7	10.0	12.0	g		26									1.25	1.13	Lean Clay
	8	12.0	14.0	gn		29	101	43	19	24	66		0.89	1.01	1.63	1.13	Lean Clay
	6	14.0	16.0	a _n		21									0.40	0.63	Sandy Lean Clay
	10	16.5	18.0	SS	12	21					43			**********			Silty Sand
	=	18.0	20.0	9		21									0.25	0.63	Sandy Lean Clay
	12	23.0	25.0	9		29									1.50	1.88	Fat Clay
LEGEND:	SS AS X B AG X B B B B B B B B B B B B B B B B B B B	= UNDISTU = SPLIT SI = AUGER (= PITCHER = Nx-DOU	= UNDISTURBED SAMPLE, EXTRUDI SPLIT SPOON SAMPLE A AUGER CUTINGS PITCHER BARREL SAMPLE NX—DOUBBLE BARREL SAMPLE	MPLE, MPLE SAMPL SREL S	E E	FIELD		SP TP "	St	andard Iuid Lir ostic Li sticity	Standard Penetration Test Liquid Limit Plastic Limit Plasticity Index	Test					
	1																



APPENDIX C

Piezometer Abandonment Reports

STATE OF TEXAS WELL REPORT for Tracking #338184

Owner: Minnetex Place Almeda

Owner Well #: GB-1

Address:

8703 Brae Acres Rd Houston, TX 77074 Grid #:

65-22-7

Well Location:

8703 Brae Acres Rd

Houston, TX 77074

Latitude:

29° 37' 35" N

Well County:

Harris

Longitude:

095° 20' 10" W

Elevation:

No Data

GPS Brand Used:

Magellan

Type of Work:

New Well

Proposed Use:

Monitor

Drilling Date:

Started: 7/22/2013 Completed: 7/22/2013

Diameter of Hole:

Diameter: 2 in From Surface To 25 ft

Drilling Method:

Mud Rotary Bored

Borehole Completion:

Gravel Packed From: 15 ft to 25 ft

Gravel Pack Size: 20/40

Annular Seal Data:

1st Interval: **No Data** 2nd Interval: **No Data** 3rd Interval: **No Data**

Surface Completion:

Alternative Procedure Used

Water Level:

Static level: **No Data**Artesian flow: **No Data**

Packers:

No Data

Plugging Info:

Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: **No Data**Depth of Strata: **No Data**

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable

constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled

under the driller's direct supervision) and that each and all of the

statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for

completion and resubmittal.

Company Information:

Envirotech Drilling Services 2718 South Brompton Drive

Pearland, TX 77584

Driller License Number:

58171

Licensed Well Driller Signature:

Jaime Vasquez

Registered Driller Apprentice Signature:

Mario Gonzalez

Apprentice Registration Number:

No Data

Comments:

No Data

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking #338184) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

CASING, BLANK PIPE & WELL SCREEN DATA

From (ft) To (ft) Description
0-1 8" SA Shell w/Cl
1-2 DK g SA CL
2-8 g-Br
8-10 Br
10-11 RD-CL
11-16 BR SA
16-25 Br CL

Dia. New/Used Type Setting From/To 2" New PVC Riser 0-15 sch.40
2" New PVC Screen 15-25 0.010

STATE OF TEXAS PLUGGING REPORT for Tracking #90480

Owner:

Geotest Engineering

Owner Well #:

GB-1

Address:

5600 Bintliff

Grid #: Houston, TX 77036

65-30-1

Well

4529 Lincolnshire

Latitude:

29° 37' 10" N

Location:

Well County:

Houston, TX 77048

Longitude:

095° 20' 45" W

GPS Brand Used:

Magellan

Well Type:

Monitor

Harris

HISTORICAL DATA ON WELL TO BE PLUGGED

Original Well

Mario Gonzalez

Driller:

Driller's License

No Data

Number of Original Well

Driller:

Date Well Drilled: 7/22/2013

Well Report

338184

Tracking Number:

Diameter of Borehole:

4 inches

Total Depth of

Borehole:

25' feet

Date Well

10/14/2013

Plugged:

Person Actually

Mario Gonzalez

Performing Plugging Operation:

License Number of Plugging Operator:

58171

Plugging Method:

Tremmie pipe cement from bottom to top.

Plugging Variance

No Data

#:

Casing Left Data: 1st Interval: No Data

> 2nd Interval: No Data 3rd Interval: No Data

10/29/13

Plugs Placed in

Well:

Cement/Bentonite 1st Interval: From 0 ft to 2 ft; Sack(s)/type of cement used: Concrete

2nd Interval: From 2 ft to 25 ft; Sack(s)/type of cement used: Grout/Cement 3rd Interval: No Data

4th Interval: No Data 5th Interval: No Data

Certification Data: The plug installer certified that the plug installer plugged this well (or the well was

plugged under the plug installer's direct supervision) and that each and all of the statements herein are true and correct. The plug installer understood that failure to complete the required items will result in the log(s) being returned for completion and

resubmittal.

Company Information: **Envirotech Drilling Services** 2718 S. Brompton Drive Pearland, TX 77584

Plug Installer License Number: 58171

Licensed Plug

Installer Signature: Jaime Vasquez

Registered Plug

Installer **Apprentice** Signature:

Mario Gonzalez

Apprentice

No Data

Registration Number:

Plugging Method

Comments:

Amended at request of driller. Unable to utilize amendment request

functionality - 10/28/13 DT

Please include the plugging report's tracking number (Tracking #90480) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #338173

Owner: Minnetex Place Almeda Owner Well#: **GB-10**

Address:

8703 Brae Acres Rd

Grid #: 65-22-7

Houston, TX 77074

Well

8703 Brae Acres Rd

29° 37' 35" N

Location: Houston, TX 77074

Well

Harris

Longitude:

Latitude:

095° 20' 10" W

County:

Elevation: No Data

GPS Brand Used:

Magellan

Type of

New Well

Proposed Use:

Monitor

Work:

Drilling

Started: 7/22/2013

Date:

Completed: 7/22/2013

Diameter of Diameter: 2 in From Surface To 25 ft

Hole:

Drilling

Mud Rotary Bored

Method:

Borehole

Gravel Packed From: 15 ft to 25 ft

Completion: Gravel Pack Size: 20/40

Annular

1st Interval: No Data

Seal Data:

2nd Interval: No Data

3rd Interval: No Data

Surface

Alternative Procedure Used

Completion:

Water

Static level: No Data

Level:

Artesian flow: No Data

Packers:

No Data

Plugging

Casing or Cement/Bentonite left in well: No Data

Info:

Type Of

No Data

Pump:

Well Tests: No Data

Water

Type of Water: No Data Depth of Strata: No Data

Quality:

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable constituents: No

Data

Data:

Certification The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being

returned for completion and resubmittal.

Company

Envirotech Drilling Services Information: 2718 South Brompton Drive

Pearland, TX 77584

Driller

58171

License Number:

Licensed

Jaime Vasquez

Well Driller Signature:

Registered

Mario Gonzalez

Driller

Apprentice Signature:

Apprentice

No Data

Registration Number:

Comments: No Data

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking #338173) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880

DESC. & COLOR	OF FORMATION
MATERIAL	

CASING, BLANK PIPE & WELL SCREEN DATA

From (ft) To (ft) Description 0-1.5 10" BI SA Asphalt g shell 1.5-2.5 DK g CL 2.5-8 y-g

Dia. New/Used Type Setting From/To
2" New PVC Riser 0-15 sch.40
2" New PVC Screen 15-25 0.010

8-12 RD 12-25 Br STATE OF TEXAS PLUGGING REPORT for Tracking #90478

Owner:

Geotest Engineering

Owner Well #:

GB-10

Address:

5600 Bintliff

Houston, TX 77036

Grid #:

65-30-1

Well

4949 Glengarry Dr

Latitude:

29° 37' 04" N

Location:

Well County:

Houston, TX 77048

Longitude:

095° 20' 16" W

GPS Brand Used:

Magellan

Well Type:

Monitor

Harris

HISTORICAL DATA ON WELL TO BE PLUGGED

Original Well

Mario Gonzalez

Driller:

Driller's License No Data

Number of Original Well Driller:

Date Well Drilled:

7/22/2013

Well Report

338173

Tracking Number:

Diameter of

4" inches

Borehole:

Total Depth of

Borehole:

25' feet

Date Well

10/14/2013

Plugged:

Person Actually

Mario Gonzalez

Performing Plugging

Operation:

License Number

58171

of Plugging Operator:

Plugging Method:

Tremmie pipe cement from bottom to top.

Plugging Variance No Data

#:

Casing Left Data:

1st Interval: No Data

2nd Interval: No Data 3rd Interval: No Data

10/29/13

Plugs Placed in Well:

3rd Interval: No Data

Cement/Bentonite 1st Interval: From 0 ft to 2 ft; Sack(s)/type of cement used: Concrete 2nd Interval: From 2 ft to 25 ft; Sack(s)/type of cement used: Grout/Cement

> 4th Interval: No Data 5th Interval: No Data

Certification Data: The plug installer certified that the plug installer plugged this well (or the well was

plugged under the plug installer's direct supervision) and that each and all of the statements herein are true and correct. The plug installer understood that failure to complete the required items will result in the log(s) being returned for completion and

resubmittal.

Company Information:

Envirotech Drilling Services 2718 S. Brompton Drive Pearland, TX 77584

Plug Installer License Number: 58171

Licensed Plug

Installer

Jaime Vasquez

Signature:

Registered Plug

Installer Apprentice Signature:

Mario Gonzalez

Apprentice Registration Number:

No Data

Plugging Method

Amended at request of driller. Unable to utilize amendment request

Comments:

functionality - 10/28/13 DT

Please include the plugging report's tracking number (Tracking #90478) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #338180

Owner:

Minnetex Place Almeda

Owner Well #:

GB-12

Address:

8703 Brae Acres Rd

Grid #: Houston, TX 77074

65-22-7

Well Location:

8703 Brae Acres Rd

Houston, TX 77074

Latitude:

29° 37' 35" N

Well County.

Harris

Longitude:

095° 20' 10" W

Elevation:

No Data

GPS Brand Used:

Magellan

Type of Work:

New Well

Proposed Use:

Monitor

Drilling Date:

Started: 7/22/2013 Completed: 7/22/2013

Diameter of Hole:

Diameter: 2 in From Surface To 25 ft

Drilling Method:

Mud Rotary Bored

Borehole Completion:

Gravel Packed From: 15 ft to 25 ft

Gravel Pack Size: 20/40

Annular Seal Data:

1st Interval: No Data 2nd Interval: No Data 3rd Interval: No Data

Surface Completion:

Alternative Procedure Used

Water Level:

Static level: No Data Artesian flow: No Data

Packers:

No Data

Plugging Info:

Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: No Data Depth of Strata: No Data

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable

constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the

statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for

completion and resubmittal.

Company Information:

Envirotech Drilling Services 2718 South Brompton Drive

Pearland, TX 77584

5/1/2014

Well Report: Tracking #:338180

Driller License Number:

58171

Licensed Well Driller Signature:

Jaime Vasquez

Registered Driller Apprentice Signature:

Mario Gonzalez

Apprentice Registration Number:

No Data

Comments:

No Data

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #338180) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

CASING, BLANK PIPE & WELL SCREEN DATA

Setting From/To

From (ft) To (ft) Description

0-1 3" SA Shell 1-2 DR g SA CL

2-6 Br-g

6-8 Si-Cl

8-9 RD-CL

9-25 Br

O/ONO, DE/WICH II E & VIETE OOKEEN D/II

Dia. New/Used Type

2" New PVC Riser 0-15 sch.40

2" New PVC Screen 15-25 0.010

STATE OF TEXAS PLUGGING REPORT for Tracking #90479

Owner:

Geotest Engineering

Owner Well #:

GB-12

Address:

5600 Bintliff

Houston, TX 77036

Grid #:

65-30-1

Well

4702 Allison Rd

Houston, TX 77048

Latitude:

29° 36' 59" N

Location:

Well County:

Longitude:

095° 20' 34" W

GPS Brand Used:

Magellan

Well Type:

Monitor

Harris

HISTORICAL DATA ON WELL TO BE PLUGGED

Original Well

Mario Gonzalez

Driller:

Driller's License

No Data

Number of Original Well

Driller:

Date Well Drilled:

7/22/2013

Well Report

338180

Tracking Number:

Diameter of Borehole:

4 inches

Total Depth of

Borehole:

25' feet

Date Well

10/14/2013

Plugged:

Person Actually

Mario Gonzalez

Performing Plugging

Operation:

License Number

58171

of Plugging Operator:

Plugging Method:

Tremmie pipe cement from bottom to top.

Plugging Variance No Data

#:

Casing Left Data:

1st Interval: No Data

2nd Interval: No Data 3rd Interval: No Data

10/29/13

Pluas Placed in

Well:

Cement/Bentonite 1st Interval: From 0 ft to 2 ft; Sack(s)/type of cement used: Concrete

2nd Interval: From 2 ft to 25 ft; Sack(s)/type of cement used: Grout/Cement

3rd Interval: No Data 4th Interval: No Data 5th Interval: No Data

Certification Data: The plug installer certified that the plug installer plugged this well (or the well was

plugged under the plug installer's direct supervision) and that each and all of the statements herein are true and correct. The plug installer understood that failure to complete the required items will result in the log(s) being returned for completion and

resubmittal.

Company Information: **Envirotech Drilling Services** 2718 S. Brompton Drive Pearland, TX 77584

Plug Installer License Number:

58171

Licensed Plug

Installer Signature: Jaime Vasquez

Registered Plug

Installer Apprentice Signature:

Mario Gonzalez

Apprentice Registration

Number:

No Data

Plugging Method

Amended at request of driller. Unable to utilize amendment request

Comments:

functionality - 10/28/13 DT

Please include the plugging report's tracking number (Tracking #90479) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #338193

Owner:

Minnetex Place Almeda

Owner Well #:

GB-17

Address:

8703 Brae Acres Rd

Houston, TX 77074

Grid #:

65-22-7

Well Location:

8703 Brae Acres Rd

Houston, TX 77074

Latitude:

29° 37' 35" N

Well County:

Harris

Longitude:

095° 20' 10" W

Elevation:

No Data

GPS Brand Used:

Magellan

Type of Work:

New Well

Proposed Use:

Monitor

Drilling Date:

Started: 7/22/2013

Completed: 7/22/2013

Diameter of Hole:

Diameter: 2 in From Surface To 25 ft

Drilling Method:

Mud Rotary Bored

Borehole Completion:

Gravel Packed From: 15 ft to 25 ft

Gravel Pack Size: 20/40

Annular Seal Data:

1st Interval: No Data 2nd Interval: No Data 3rd Interval: No Data

Surface Completion:

Alternative Procedure Used

Water Level:

Static level: No Data
Artesian flow: No Data

Packers:

No Data

Plugging Info:

Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: **No Data**Depth of Strata: **No Data**

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable

constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled

under the driller's direct supervision) and that each and all of the

statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for

completion and resubmittal.

Company Information:

Envirotech Drilling Services 2718 South Brompton Drive

Pearland, TX 77584

Driller License Number:

58171

Licensed Well Driller Signature:

Jaime Vasquez

Registered Driller Apprentice Signature:

Mario Gonzalez

Apprentice Registration Number:

No Data

Comments:

No Data

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking #338193) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

CASING, BLANK PIPE & WELL SCREEN DATA

From (ft) To (ft) Description 0-1 12" Br SA Shell DK g CL 1-8 Br-g-SA-CL 8-12 RD-CL 12-18.5 Br SA CL 18.5-22 RD-SI-CL 22-25 RD-CL Dia. New/Used Type Setting From/To 2" New PVC Riser 0-15 sch.40
2" New PVC Screen 15-25 0.010

STATE OF TEXAS PLUGGING REPORT for Tracking #90481

Owner:

Geotest Engineering

Owner Well #:

GB-17

Address:

5600 Binfliff

Grid #: Houston, TX 77036

65-30-1

Well

13018 Cottingham

Latitude:

29° 37' 15" N

Location:

Well County:

Houston, TX 77048

Longitude:

095° 20' 27" W

GPS Brand Used:

Magellan

Well Type:

Monitor

Harris

HISTORICAL DATA ON WELL TO BE PLUGGED

Original Well

Mario Gonzalez

Driller:

Driller's License

No Data

Number of Original Well

Driller:

Date Well Drilled:

7/22/2013

Well Report

338193

Tracking Number:

Diameter of

4 inches

Borehole:

Total Depth of

Borehole:

25' feet

Date Well

10/14/2013

Plugged:

Person Actually

Mario Gonzalez

Performing Plugging

Operation:

License Number

58171

of Plugging Operator:

Plugging Method:

Tremmie pipe cement from bottom to top.

Plugging Variance No Data

#:

Casing Left Data:

1st Interval: No Data 2nd Interval: No Data 3rd Interval: No Data

10/29/13

Plugs Placed in Well:

Cement/Bentonite 1st Interval: From 0 ft to 2 ft; Sack(s)/type of cement used: Concrete

2nd Interval: From 2 ft to 25 ft; Sack(s)/type of cement used: Grout/Cement

3rd Interval: No Data 4th Interval: No Data 5th Interval: No Data

Certification Data: The plug installer certified that the plug installer plugged this well (or the well was plugged under the plug installer's direct supervision) and that each and all of the statements herein are true and correct. The plug installer understood that failure to complete the required items will result in the log(s) being returned for completion and

resubmittal.

Company Information: **Envirotech Drilling Services** 2718 S. Brompton Drive Pearland, TX 77584

Plug Installer License Number: 58171

Licensed Plug

Jaime Vasquez

Installer Signature:

Registered Plug

Mario Gonzalez

Installer Apprentice Signature:

Apprentice

No Data

Registration Number:

Plugging Method

Comments:

Amended at request of driller. Unable to utilize amendment request

functionality - 10/28/13 DT

Please include the plugging report's tracking number (Tracking #90481) on your written request.

Texas Department of Licensing & Regulation P.O. Box 12157 Austin, TX 78711 (512) 463-7880